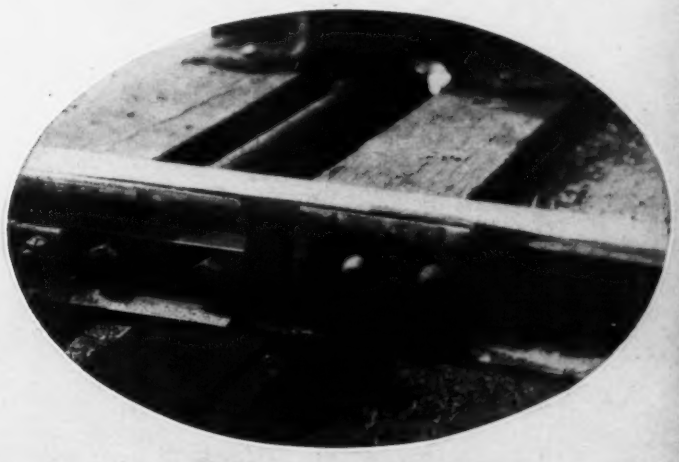
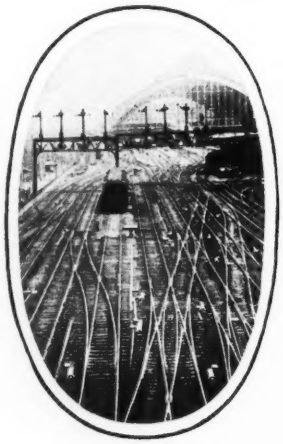
Railway Engineering and Maintenance

If You Install The



"MACK" Reversible Switch Point PROTECTOR

Your Switch Points will Last from 5 to 10 times Longer than otherwise



HY-CROME exerts a re-active pressure against the nut which long wear, extreme vibrations or repeated use can not impair—the result is permanent rail joint security at minimum spring washer cost. Let your next requisition for spring washers read "Hy-Crome."

THE RELIANCE MFG. CO.
MASSILLON, OHIO

NEW YORK. CLEVELAND, DETROIT. CHICAGO, ST. LOUIS, SAN FRANCISCO

N. S. Kenney, Munsey Bldg., Baltimore, Md.
Engineering Materials, Ltd., McGill Bldg., Montreal, Quebec, Canada.

HY-CROME
Spring Washers

RAILWAY ENGINEERING AND MAINTENANCE
Published monthly by Simmons-Boardman Publishing Co., at 608 S. Dearborn St., Chicago. Subscription price: United States, Canada and Mexico, $2.00; foreign countries, $3.00 a year. Single copy, 35 cents. Entered at Chicago, Ill., as second-class matter.

Alphabetical Index to Advertisers, Page 54
Classified Index to Advertisers, 52-54

LOWER COST PER CAR PER MILE

Historic Harpers Ferry

HISTORY is being made today as surely as it was when the old wood-burner on America's oldest railroad first steamed into Harpers Ferry. There, as everywhere on American railroads, modern economies are pushing out antiquated methods. In the transportation of men and materials, motor cars have supplanted hand cars.

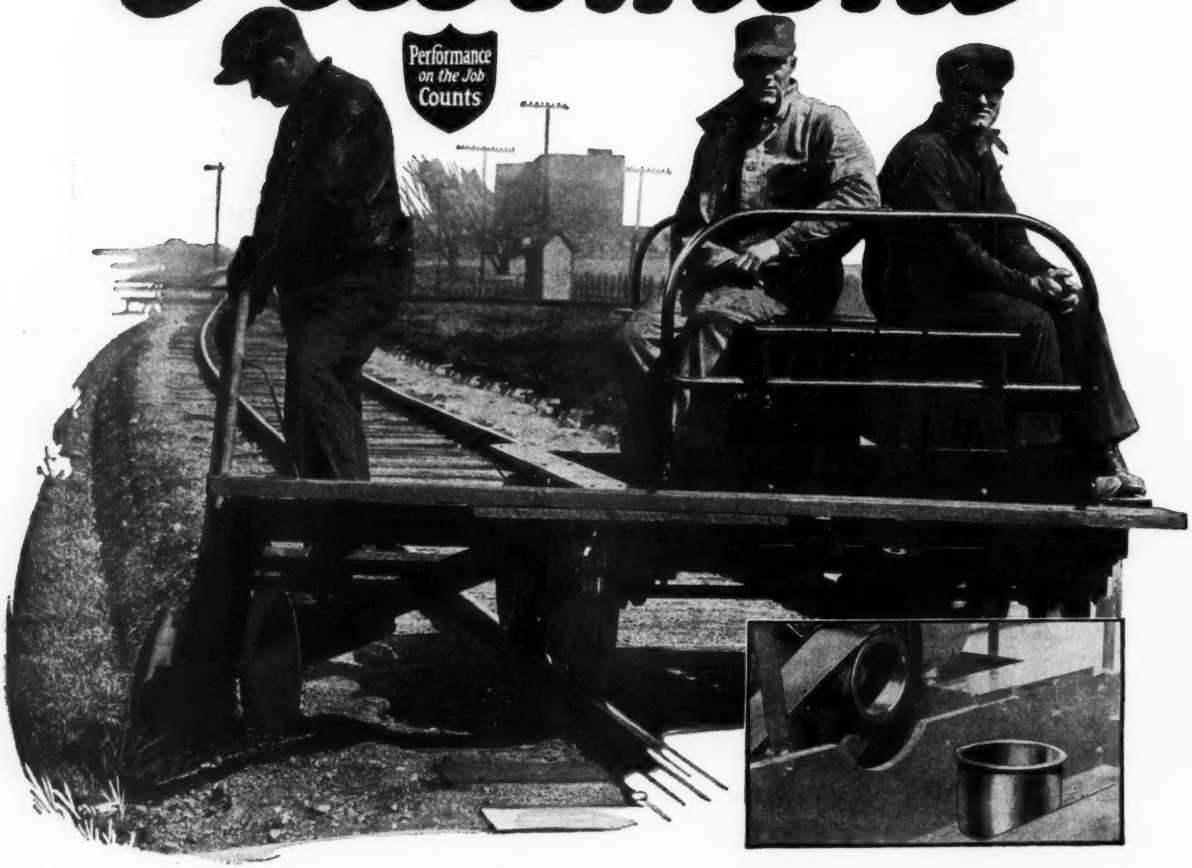
Mudge Motor Cars are making history today by establishing new and higher standards of motor car design and construction. They have plenty of power. They are simple, of rugged construction and always dependable.

Mudge & Company

Manufacturers—Railroad Equipment
Railway Exchange Building, Chicago

A MOTOR CAR FOR EVERY SERVICE

Fairmont



Every Part Easy to Reach

FAIRMONT RAILWAY MOTOR CARS	
M19	Inspection Car for 1 to 4 men.
M14	Light Section Car for gangs up to 6 men.
*A2 *M2 *S2	Section Cars. Seating capacities from 8 to 12 men. Pulling capacities up to 50 men.

*AT2 — MT2 — ST2 are corresponding models equipped with 2 speed transmission for extra heavy pulling.

Maintenance costs on Fairmont Cars are lower not only because these cars are more staunchly constructed and require less servicing—but because the ready accessibility of all parts makes the little servicing that is necessary **easier** and **faster.**

Changing pulleys to secure unusually low speeds for emergency work such as pulling sod line cutters, track mowers, operating pumps for air hammers, etc., is no task at all with the quick-detachable pulley units of the Fairmont. For quicker replacements battery cells are arranged as one complete unit. Removable floor boards permit easy access to fly wheel without loosening the engine bolts. Details—these—yet they are as much responsible for the greater economy of Fairmont Cars as their extra pulling power which insures lower fuel costs.

More than 700 railroads including most of the large systems, are benefiting from Fairmont economy, safety and dependability. Why not yours?

FAIRMONT RAILWAY MOTORS, Inc.
FAIRMONT, MINNESOTA

DISTRICT SALES OFFICES: NEW YORK CHICAGO SAN FRANCISCO ST. LOUIS WASHINGTON, D. C. WINNIPEG, CANADA

CONTENTS

Volume 22 September, 1926 Number 9

How Objectionable Is Decay in Ties? Elmer T. Howson 344
Bridge and Building Supervisors or Master Carpenters? 347
Welding Battered Joints Has Proved Economical 350
Spray Painting Proves Effective in Maintenance Department 355
System Gangs Cut Rail Laying Costs 20 Per Cent 359

Editorials 341
Why Not Do Something About It? 341
The Cost of Laying Rail 341
Adequate Training Is Necessary 341
What Is Your Title? 342
Modern Turntables 342
A Track Man's Interest in the Seasoning of Ties 343
Letters to the Editor 343
Support for Turntable Circle Rails 343
New Unsymetrical Head Rail Section Produces Effect of Rail Canting 349
What It Requires to Maintain an Important Railroad; J. V. Neubert 357
What a Foreman Thinks of Uniform Forces; Clarence J. Jones 362
Specifications for Ties Explained with Diagrams 367
What's the Answer? 363
Cleaning Bridges by Sand Blast 363
Keeping Maintenance Tools in Good Condition 364
Concrete or Brick for Station Platforms 364
Tamping New Ties 365
Rendering Treated Timber Fire Resistant 365
Repairing Cracked Water Pipes or Leaking Joints 365
Care in Flagging 366
Tamping with a Ballast Fork 366
Getting the Manufacturers' Help 368
A Portable Direct Connected Generator Power Plant 368
The Casey Jones Heavy Duty Motor Car Trailer 369
A New Rail Anchor 369
Odenkirk Switch Stand Embraces New Features 370
A Cast Iron Headwall for Spiral Corrugated Cast Iron Pipe Culverts 370
The Mudge Spring Drawbars for Motor Car Trailers 371
With the Associations 371
The Material Market 372
News of the Month 373
Personal Mention 374
Construction News 376
Supply Trade News 378

294

Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

ELMER T. HOWSON, *Editor*
WALTER S. LACHER, *Managing Editor*
N. D. HOWARD, *Associate Editor*
F. C. KOCH, *Business Manager*
H. F. LANE, *Associate Editor*, (Washington, D. C.)
F. M. PATTERSON, *Associate Editor*

Published on the last Thursday preceding the date of issue by the

Simmons-Boardman Publishing Company, 608 South Dearborn Street, Chicago, Ill.

EDWARD A. SIMMONS, *President*
L. B. SHERMAN, *Vice-Pres.*
HENRY LEE, *Vice-Pres. & Treas.*
SAMUEL O. DUNN, *Vice-Pres.*
F. H. THOMPSON, *Vice-Pres.*
C. R. MILLS, *Vice-Pres.*
ROY V. WRIGHT, *Sec'y*

NEW YORK: 30 Church Street
MANDEVILLE, LA.
CLEVELAND: 6007 Euclid Avenue
WASHINGTON: 17 and H Streets, N. W.
SAN FRANCISCO: 74 New Montgomery Street
LONDON, England: 34, Victoria St., Westminster, S. W. 1
Cable Address: Urasigmec, London

Entered at the postoffice at Chicago, Ill., as mail matter of the second class.

Request for change of address should reach us two weeks before the date of the issue with which it is to go into effect. It is difficult and often impossible to supply back numbers to replace those undelivered through failure to send advance notice. In sending us change of address please be sure to send us your old address as well as the new one.

Subscription price in the United States, Canada and Mexico, $2.00 per year; foreign countries $3.00. Single copies, 35 cents. Foreign subscriptions may be paid through our London office (34, Victoria Street, S. W. 1) in £-s-d.

Railway Engineering and Maintenance is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulation (A. B. C.)

Announcing *the* "Bethco" Rail Anchor

A Few Salient Features

Shipped, distributed and applied as one piece—parts do not separate

No special tools are required

Full length bearing against tie

Fits new, rerolled old, worn or corroded rails

Possesses all the advantages of one-piece anchor with the addition of positive take up which only two pieces can provide.

Descriptive pamphlet sent on request

BETHLEHEM STEEL COMPANY, *General Offices:* BETHLEHEM, PA.

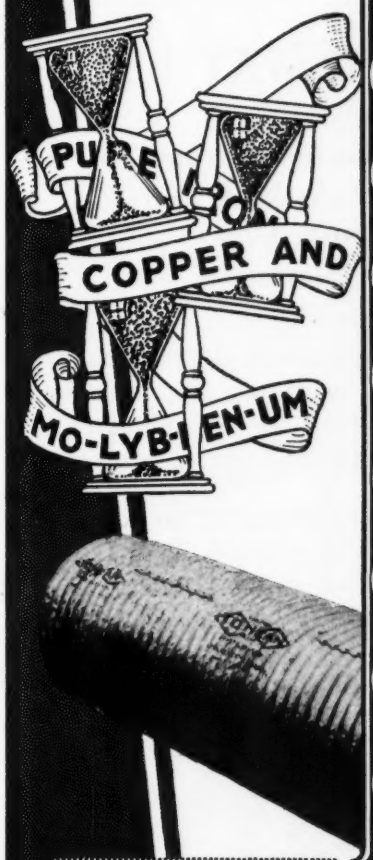
DISTRICT OFFICES

New York Boston Philadelphia Baltimore Washington Atlanta Pittsburgh Buffalo
Cleveland Detroit Cincinnati Chicago St. Louis San Francisco Los Angeles Seattle Portland

Bethlehem Steel Export Corporation, 25 Broadway, New York City, Sole Exporter of our Commercial Products

BETHLEHEM

This Discovery Has Tripled The Life Of Culvert Iron



Scientific alloying of copper and mo-lyb-den-um with carefully refined iron has developed a culvert metal with amazing resistance to rust and corrosion, and tensile strength much greater than any material now used in corrugated culverts. Scores of tests prove it to last from four to fourteen times as long under violent corrosive attack as the best materials hitherto available.

It marks a signal victory in man's age-old battle against rust and corrosion. It is called Toncan Copper Mo-lyb-den-um Iron.

The advantages of easy handling, freedom from breakage, economical installation and supreme strength always have belonged to good corrugated culverts as a class. Now, with this new material, comes a degree of performance never before attained.

The manufacturers listed below produce Toncan Copper Mo-lyb-den-um Culverts in all standard sizes and also perforated, with tees, elbows, crosses, etc.

They offer you culverts with three times the life at no increase in cost! Write the nearest one.

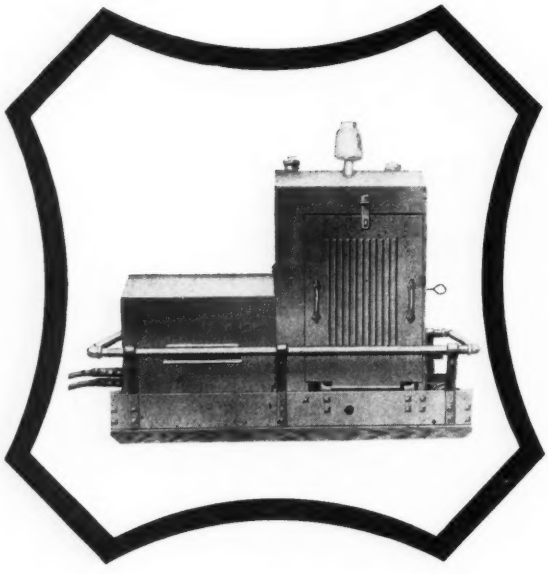
UNITED ALLOY STEEL CORP.
CANTON, OHIO

REG U.S. PAT OFF
TONCAN
COPPER
Mo-lyb-den-um
IRON
CULVERTS

The following manufacturers produce Toncan Copper Mo-lyb-den-um Culverts. Write the nearest one.

The Canton Culvert & Silo Co., Canton, O.
Tri-State Culvert Manufacturing Co., Memphis, Tenn.
The Berger Manufacturing Co., Minneapolis, Minn.
The Firman L. Carswell Mfg. Co., Kansas City, Kans.
The Berger Mfg. Co. of Mass., Boston, Mass.
The Philadelphia Culvert Co., Philadelphia, Pa.
The Berger Manufacturing Co., Dallas, Tex.
The Berger Manufacturing Co., Roanoke, Va.
The Berger Manufacturing Co., Jacksonville, Fla.

UNITED ALLOY STEEL CORPORATION



ANNOUNCING
THE NEW JACKSON ELECTRIC PORTABLE POWER PLANTS FOR RAILWAY USE

Designed for the operation of 4, 8 and 12 Jackson Electric Tamper Units

In addition to the 4-Tamper unit and to meet the demand for an electric power plant that would operate a sufficient number of tampers for use by large gangs, and still be portable, the Electric Tamper & Equipment Company announce the production of two new units having capacities to operate eight and twelve tampers.

These new power units are universal, developing both alternating and direct current, and in addition to tampers will operate any class of portable A. C. or D. C. tools within their capacity such as rail saws, rail and bonding drills, grinders, etc.

These units further provide an ideal plant for operating lights either for emergency or continuous service.

The plants are portable, rugged and designed for use by unskilled labor, no instruments, fuses or protective devices being required. As no special foundation is required, they can be set up at any point along the right of way.

Write for detailed information

ELECTRIC TAMPER & EQUIPMENT CO.
Chicago, Illinois

The answer to better bolts

The right alloy steel will withstand three times the strain of iron before it begins to stretch because the elastic limit of iron under actual test is only one-third that of alloy steel. So it stands to reason that engine bolts made of the proper alloy steel will stand up in service better than engine bolts made of iron. There is the answer to better bolts.

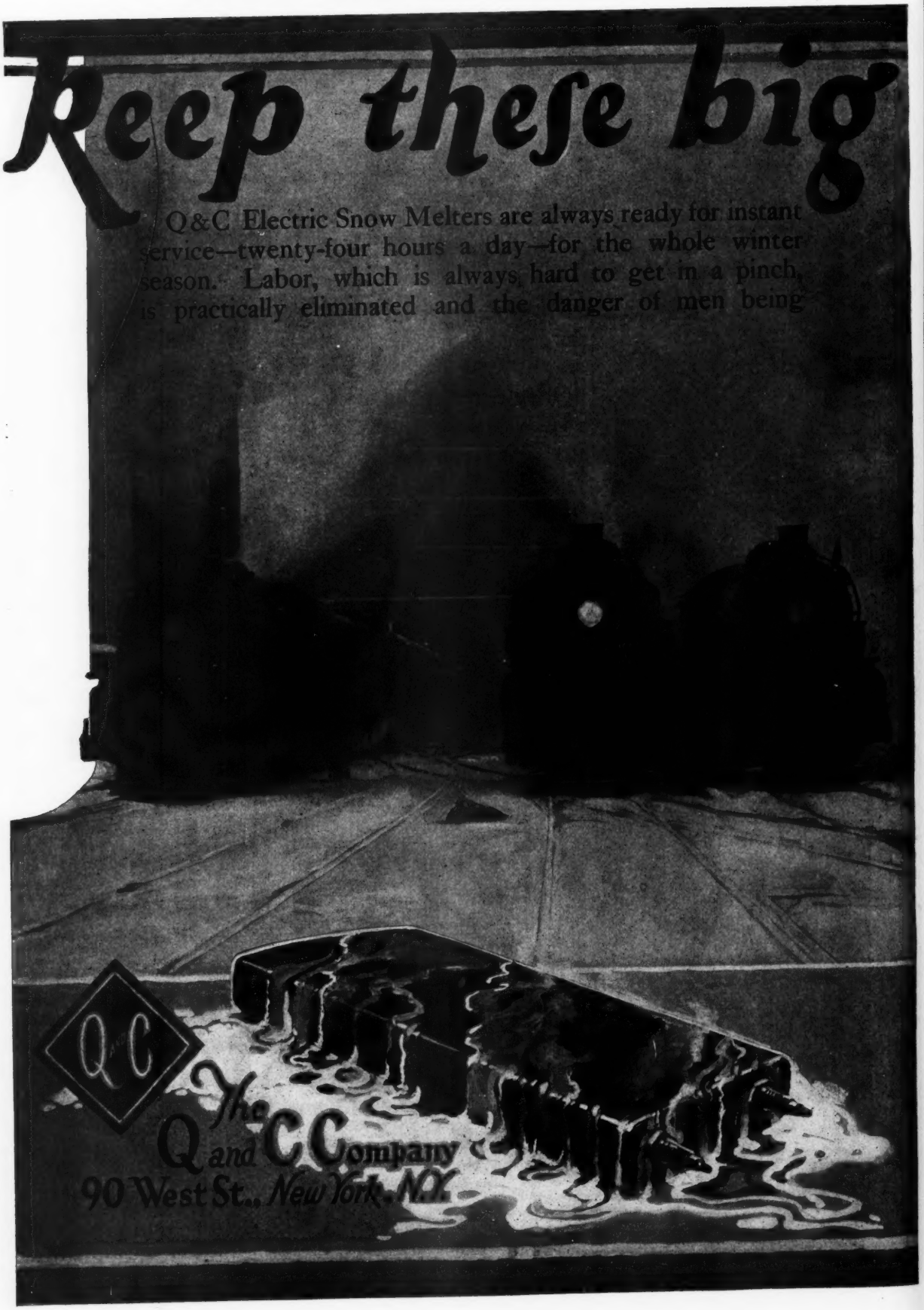
INTERSTATE IRON & STEEL CO.
104 South Michigan Avenue
CHICAGO

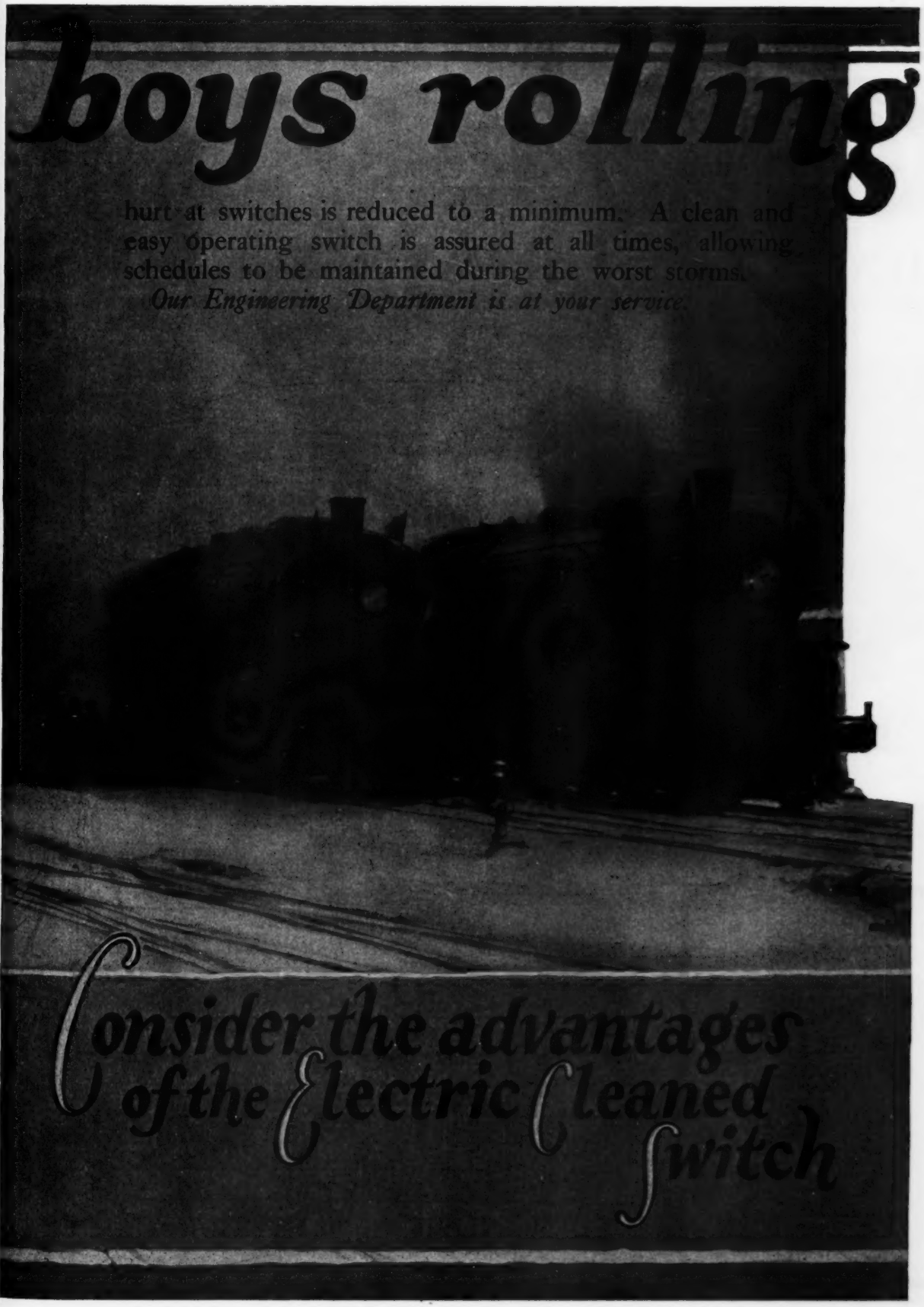
Open Hearth Alloy Steel Ingots, Billets, Bars
Wire Rods, Wire, Nails, Rivets and Cut Tacks
Iron Bars and Railroad Tie Plates

Interstate Steels

District Offices:

NEW YORK—52 Vanderbilt Avenue
DETROIT—Washington Boulevard Bldg.
MILWAUKEE—First Wisconsin National Bank Building
CLEVELAND—Union Trust Building
ST. PAUL—Merchants National Bank Building
ST. LOUIS—International Life Building
SAN FRANCISCO—Monadnock Bldg.
KANSAS CITY—Reliance Building


Keep these big
Q&C Electric Snow Melters are always ready for instant service—twenty-four hours a day—for the whole winter season. Labor, which is always hard to get in a pinch, is practically eliminated and the danger of men being
Q C
The Q and C Company
90 West St., New York, N.Y.


boys rolling
hurt at switches is reduced to a minimum. A clean and easy operating switch is assured at all times, allowing schedules to be maintained during the worst storms.
Our Engineering Department is at your service.
Consider the advantages of the Electric Cleaned Switch

Making new records with a new car—

Casey Jones REG U.S. PAT. OFF. 551

HEAVY DUTY RAILWAY MOTOR CAR

With Standard Ford Motor—20 H. P.—and Casey Jones Automotive Gear Transmission—Equal Power Either Direction

Write for Full Information

Branch Offices:
WASHINGTON, D. C.
W. NEWTON JEFFRESS, INC.
Eastern Executive, 1319 F Street N. W.
NEW YORK
WALTER H. ALLEN
30 Church Street
PITTSBURGH
TOM C. KING
First National Bank Bldg.
CHICAGO
OTIS B. DUNCAN
53 W. Jackson Boulevard
BIRMINGHAM
A. A. CULP
239 Brown-Marx Bldg.
ST. LOUIS
WM. J. ROEHL
Railway Exchange
ST. PAUL
RANK & GOODELL
906 Merchants Bank Bldg
SAN FRANCISCO
W. H. WORDEN CO.
126 Pine Street
PORTLAND
WESTERN RAILWAY SUPPLY CO.
15th & Johnson Sts.
FOREIGN
KOPPEL INDUST. CAR & EQUIP. CO.
Koppel, Pa., Exclusive Export Agents

For Extra Gangs—Bridge Crews—Hump and Signal Service—Operating Weed Mowers—Discing Machines and all heavy duty service. Capable of moving 150 men with trailers.

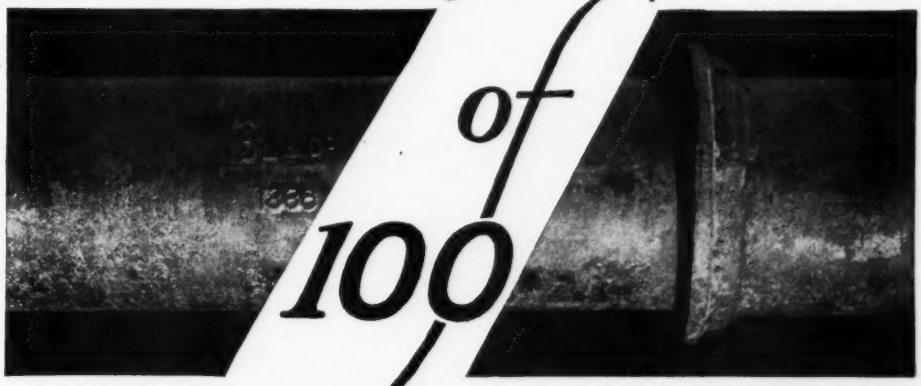
THE RIGHT CAR FOR EVERY CLASS OF SERVICE			
Class A	For Heavy Duty	Casey Jones 551	4 to 150 Men—Trailers
Class B	For Standard Section	Casey Jones 521	2 to 30 Men—Trailers
Class C	For Light Inspection	Casey Jones 531	1 to 4 Men

NORTHWESTERN MOTOR CO.

MANUFACTURERS

FACTORY AND GENERAL OFFICE—EAU CLAIRE, WIS.

In the Light of 100 Years of Use



IF the Bell and Spigot Joint was a new invention, it would be eagerly hailed as one of the world's greatest discoveries.

A joint easily put together in the field, tight, yet flexible and non-corroding.

All this you find in the Bell and Spigot Joint of Cast Iron Pipe and more....

It makes changes in alignment or the insertion of fittings a simple matter. It needs no help in making wide bends or accommodating itself to the natural ups and downs of cross-country work. Its laying requires only the simplest machinery.

The Bell and Spigot Joint is as sturdy as the pipe itself, as free from dangers of damage in transit, as permanent when it is put in place.

Finally, it makes Cast Iron Pipe truly reusable, as after long periods of service, the line can be taken apart and the pipe used again.

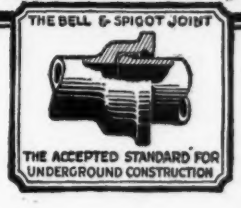
The origin of the Bell and Spigot Joint dates back into the 18th Century, so its practicability and permanence, like that of Cast Iron Pipe, has been proven in the test of centuries. It has been used in America for more than one hundred years.

This Bureau will be glad to co-operate with you in your pipe-laying problems, or in any phase of the use of Cast Iron Pipe.

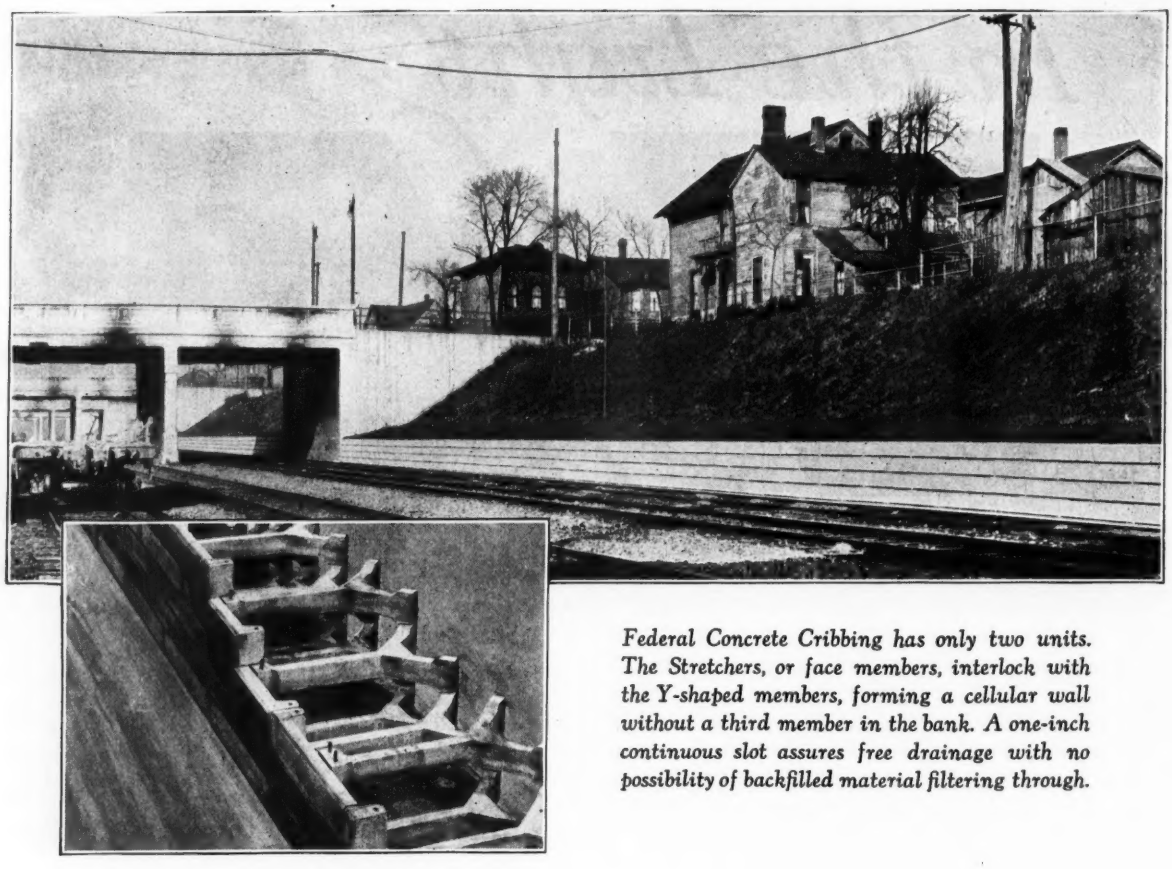
Address: RESEARCH ENGINEER
CAST IRON PIPE PUBLICITY BUREAU, PEOPLES GAS BUILDING, CHICAGO

CAST IRON PIPE

Our new booklet, "Planning a Waterworks System," which covers the problem of water for the small town, will be sent on request



Send for booklet, "Cast Iron Pipe for Industrial Service," showing interesting installations to meet special problems



Federal Concrete Cribbing has only two units. The Stretchers, or face members, interlock with the Y-shaped members, forming a cellular wall without a third member in the bank. A one-inch continuous slot assures free drainage with no possibility of backfilled material filtering through.

This makes the ideal retaining wall

FEDERAL Concrete Cribbing Units are economical in first cost. They are easily and quickly installed, possess maximum strength and durability, and have the fine appearance of good masonry. They meet fully all the requirements of permanent construction, and yet can be easily relocated with practically 100 per cent salvage.

For further information write to

FEDERAL CEMENT TILE COMPANY

608 South Dearborn Street, Chicago, Illinois

FEDERAL CONCRETE CRIBBING

More Paint Protection at no extra cost

This modern, proven way—

IT HAS been proved hundreds of times that from 40 to 70% saving is accomplished by using Matthews Mechanical Painting Equipment in the painting of interiors and exteriors of factories, garages, warehouses, apartments and other buildings. There is no more uncertainty or guess about the big savings possible. Industry everywhere is using mechanical painting methods.

Compare These Costs

These figures show the daily average of one man painting on various surfaces.

	Mechanical Painting	Brush Method
BRICK	8,000 sq. ft.	1,300 sq. ft.
CORRUGATED IRON	6,000 sq. ft.	500 sq. ft.
ROUGH STUCCO	5,000 sq. ft.	450 sq. ft.

The saving on painting interiors is even greater, as one coat of paint put on by mechanical painting equipment often is enough whereas two or three coats are necessary by the brush method. The brush mixes with the wall dust and dirt giving a streaked appearance. At least one other coat is needed. The machine applies a coat without this admixture and it is also possible to apply heavier coats with the machine without danger of paint running. This is an immediate saving of 50% on materials alone, to say nothing of less disturbance from painters slowing up your plant production while at work.

Users Agree

No other method offers such ease, speed, freedom from disturbance, economy and excellence of finished work. No other equipment will stand rough treatment like Matthews. Everywhere maintenance painting by mechanical equipment has become the accepted practice in thousands of plants. Get the facts.

For 8 Reasons

For 8 outstanding reasons Matthews is overwhelmingly preferred to any other painting equipment. Learn why.

1. It is the fastest, most rugged, high grade painting tool yet developed.

2. Complete control is in the operator's hands. A wide range of adjustments is available.

3. Mist and fog are reduced to a minimum—no uncontrolled spray, splatter or leakage.

4. It is easy to operate and understand. Average maintenance department man can quickly become proficient.

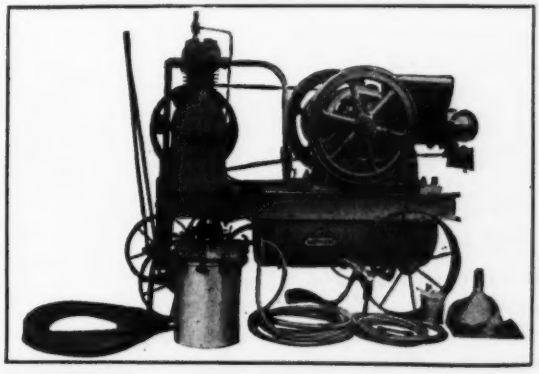
5. It is simply constructed with a minimum of parts. Rugged in construction—built for heavy duty. All wearing parts are interchangeable.

6. Parts and service available in all parts of the country.

7. It is backed by a strong service organization. With each complete power driven equipment our service man will spend sufficient time with you to thoroughly acquaint your men with its use and operation.

8. Matthews Mechanical Painting Equipment has been designed, improved and perfected and is guaranteed by a company with a reputation of 28 years of business integrity. It is built to withstand the daily grind of field service.

The W. N. Matthews Corporation manufactures a complete line of mechanical painting equipment. There is a Matthews Equipment for every painting need. If you finish products in your factory with any kind of surface coating, ask for booklet, "Mechanical Equipment for Product Finishing."



Get This Booklet

"Mechanical Painting for Industrial Maintenance" contains many interesting facts and useful data. Send for it and learn how to reduce your painting costs.

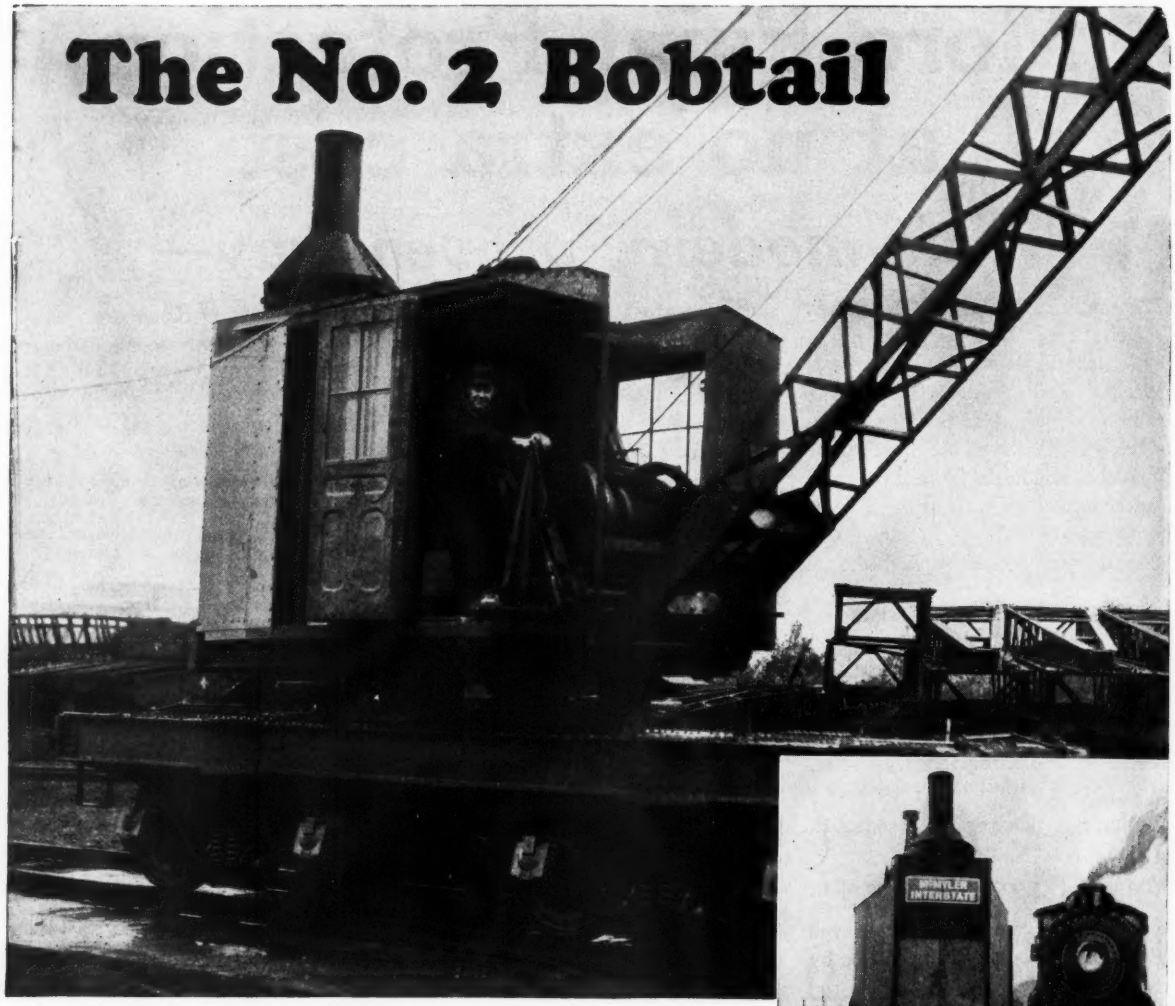
MATTHEWS MECHANICAL PAINTING EQUIPMENT

W. N. MATTHEWS CORPORATION, ST. LOUIS, MO.

W. N. Matthews Corporation,
3770 Forest Park Blvd. St. Louis, U. S. A.
Please send me your booklet "Mechanical Painting for Industrial Maintenance". (If you are interested in "Mechanical Equipment for Product Finishing" check here .....)

Name.....
Address.....
City.....State.....
Title.....

The No. 2 Bobtail



Full Speed Ahead—
when the No. 2 Bob-Tail is working on adjacent tracks. The fool-proof positive swing-stop makes collisions impossible.

A Locomotive Crane Specially Designed to Meet Railroad Problems

—has a tapered turntable and positive swing-stop, giving it a maximum swing of only 5′ 8″ from the center of the track. This means that traffic on adjacent tracks continues without interruptions or slow-downs.

This safety factor coupled with the Bob-Tail's tested and admitted ability to out-dig and out-work standard cranes and railroad-ditchers gives it a predominant place in ditching, ballast-screening and general utility equipment.

See that your road investigates the Bob-Tail.

Steam Shovels • Gas Shovels • Locomotive Cranes • Clam-shell Buckets

C-2-145

McMyler-Interstate

NEW YORK BUFFALO PHILADELPHIA PITTSBURGH **CLEVELAND** DETROIT CHICAGO SAN FRANCISCO LOS ANGELES

ONE PRINCIPLE FOR TWENTY YEARS

Extension Side Dump Cars in general maintenance service on the Pittsburgh & Lake Erie Railway.

THE BALANCED PRINCIPLE SAVES TIME

TIME is an important factor when ditcher and steam shovel outfits clean up busy main lines between train times.

With Extension Side Dump Cars, you are sure of a quick "get-a-way." The cars dump safely, quickly and with minimum requirement of air because the load and moving parts are balanced throughout the operation of dumping.

CLARK CAR COMPANY
BALANCED DOOR DUMP CARS
PITTSBURGH, PA.

PITTSBURGH

SAN FRANCISCO Rialto Building
CHICAGO 400 Railway Exchange Bldg.
RICHMOND, VA. Am. Nat. Bank Bldg.
NEW YORK 52 Vanderbilt Ave.
BOSTON 683 Atlantic Ave.

CLARK CARS
EXTENSION SIDE DUMP

SAVE 60% OF YOUR LABOR AND TOOL COST

now in use on over

100 RAILROADS

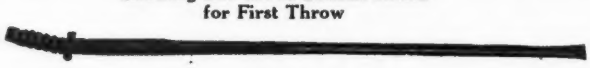
Note the Two Step Feature at the top of base. 3 to 5 men can now do the work of 7 to 9 men. 7 men can do the work of 15 to 20 men.

Hackmann Combination Track Liner
Weight 20 lb.

You can make at least two pulls without resetting the liner. No digging necessary.

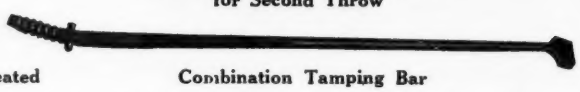
Showing Bar Set in Bottom Notch for First Throw

Showing Bars Set in Upper Notch for Second Throw



Combination Lining Bar

Heat Treated



Combination Tamping Bar

Why buy lifting type track liners for just moving track when you can use the Hackmann Track Liners for Lining Track, Frogs and Switches, Raising Low Joints and Spacing Ties. Can be operated against the end of track or switch ties where one rail is free.
You can make at least two pulls without resetting.
All Hackmann and Idol liners are made of two parts only.

Hackmann Idol Track Liner

Hackmann Duplex Track Liner

FOR USE WITH ANY ORDINARY LINING BAR

THE HACKMANN RAILWAY SUPPLY CO.

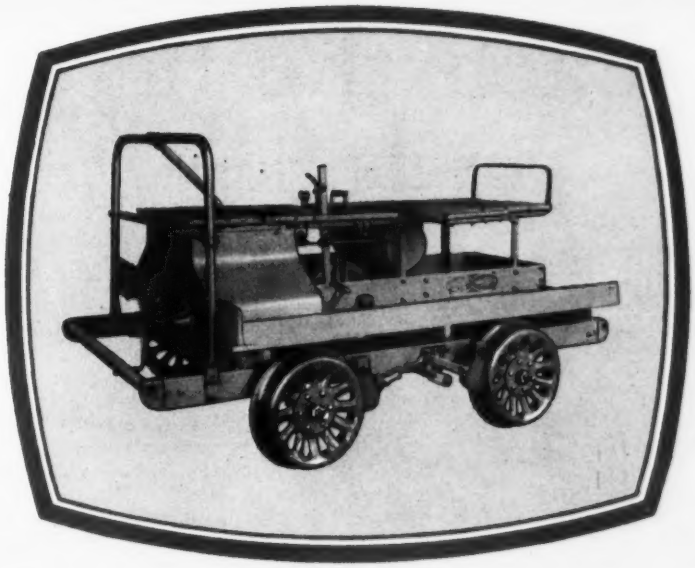
RAILWAY LABOR SAVING DEVICES—723 So. Wells St., CHICAGO, ILL.

FREDERICK HACKMANN,
President and Mechanical Engineer
J. J. FRANZEN,
Secretary and Treasurer

LAUGHLIN & CHENEY
Chicago, Ill.
W. D. ACHUFF
St. Louis

BALDWIN LOCOMOTIVE WORKS
Foreign Representatives
WM. ZEIGLER CO.
Minneapolis, Minn.

THE HOLDEN CO., Ltd., Canada
Toronto **Montreal** **Winnipeg**
Vancouver



What thirty years of steady effort have accomplished—

There is no magic about the dependability of the present line of Fairbanks-Morse Motor Cars. They reached their present state of development as a result of 30 years devoted to ceaseless effort toward a practical end.

No line of section cars has had greater advantages. Fairbanks-Morse manufacturing facilities are unsurpassed. Fairbanks-Morse engineers have designed gas engines since the internal combustion engine was in its infancy. This longer experience and greater specialization could have resulted in but one thing—cars that start right, run right, and cost less to operate.

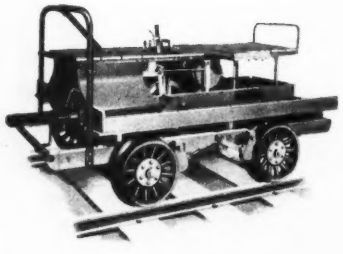
If there is any doubt in your mind as to what this experience means, ask the operator of any modern F-M car about it!

(Three Fairbanks-Morse models are described on the next page)

FAIRBANKS-MORSE
MOTOR CARS

First on the rails—and still first

Each the best in its class

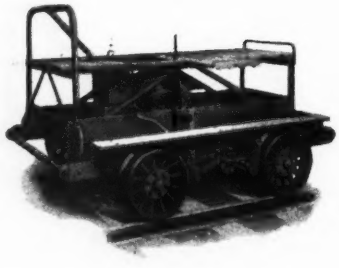


The Sheffield 40-B

Demand the utmost in motor-car performance—and you get it in the Sheffield 40-B. For meeting the many requirements of section and extra gang service this car knows no limitations. The best in automotive construction is incorporated in this model. The engine is of improved two-cylinder, air-cooled, valve-in-head design. Three-point suspension positively prevents misalignment. Timkin tapered roller bearings on crankshaft and axles prevent wear, absorb thrust and reduce friction losses. Automobile type pressed steel frame affords exceptional strength and lightness. Friction transmission is simple and dependable.

The Sheffield 45

The most recent addition to the Fairbanks-Morse line of motor cars, the Sheffield 45, has already proved its merits. The engine is two-cylinder, air-cooled, free-running with crankshaft mounted on Timken taper roller bearings. Three-point suspension—no misalignment possible. Friction transmission is greatly simplified. Countershaft is mounted on SKF self-aligning ball bearings. This car has auto type pressed steel frame and the largest deck area ever provided on a section motor car—22 square feet of unobstructed tool space.



The Sheffield 44

The great popularity of this simple, powerful car is a tribute to its exceptionally fine performance. Embodied in the Sheffield 44 is the greatest forward stride in single cylinder engine, section motor car construction—perfected clutch transmission with chain drive. The clutch is absolutely fool-proof—practically indestructible. It *can't be burned out.* Control is simple and dependable. With this car, there are no delays due to broken belts.

FAIRBANKS, MORSE & CO., Chicago

Manufacturers of railway motor cars, hand cars, push cars, velocipedes, standpipes for water and oil, tank fixtures, oil engines; steam, power and centrifugal pumps; scales; complete coaling stations.

FAIRBANKS-MORSE
MOTOR CARS

First on the rails — and still first

A815-ARA 21.6

Oil it once a month

Photo courtesy of Pittsburgh-Des Moines Steel Co.

A Money Saver *for railway water service*

Daily visits to a distant pump house to care for the pumps, are *highly expensive.* One visit a month is ample to properly care for GARDNER Self-Lubricated Pumps, for they are flood-lubricated from a single reservoir like an automobile motor. Use of motor drive permits control by electric switch from any distance. Estimate for yourself the great saving you can make with this equipment. Fully described and illustrated in Bulletin EP-1.

GARDNER GOVERNORS PUMPS · COMPRESSORS

THE GARDNER GOVERNOR COMPANY
Quincy, Illinois

CHICAGO 549 Washington Blvd.
NEW YORK 534 Singer Bldg.
PHILADELPHIA 604 Arch St.
MUSKOGEE 323 Dayton St.
SHREVEPORT 561 Rutherford St.
DALLAS 2515 Maple Ave.
HOUSTON 341 West Blvd.
SAN FRANCISCO 401 Rialto Bldg.
LOS ANGELES 634 Santa Fe Ave.
LONDON 25, Bishopgate, E.C.2

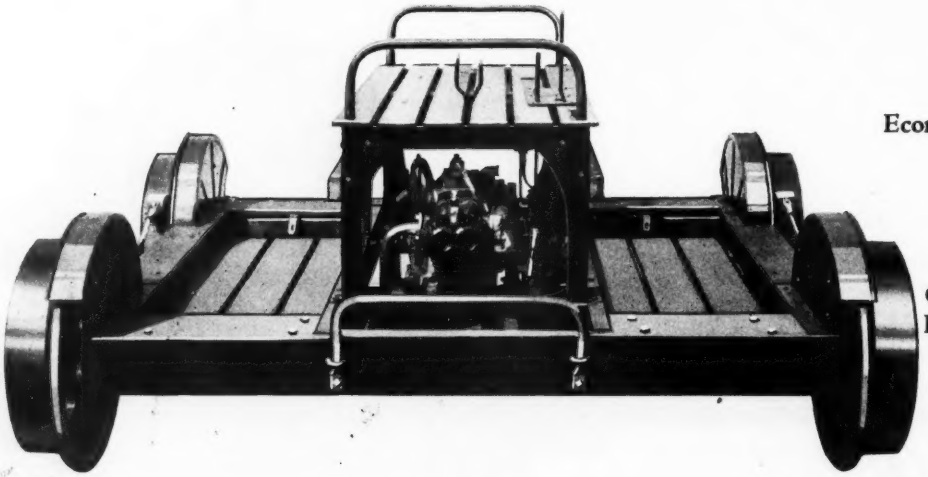
GARDNER

BUDA
ESTABLISHED 1881
PRODUCTS

The Buda Trackster

Safe

Economical



Light

Clutch Driven

Comfortable

Accessible

No. 419 Centerload Inspection Car

STEEL FRAME CONSTRUCTION
AMPLE POWER FOR GRADES
EASILY HANDLED BY ONE MAN

See it at the Auditorium Hotel
Sept. 21, 22 and 23, 1926
ROADMASTERS ASSOCIATION EXHIBIT

THE BUDA COMPANY
HARVEY (Chicago Suburb) ILLINOIS

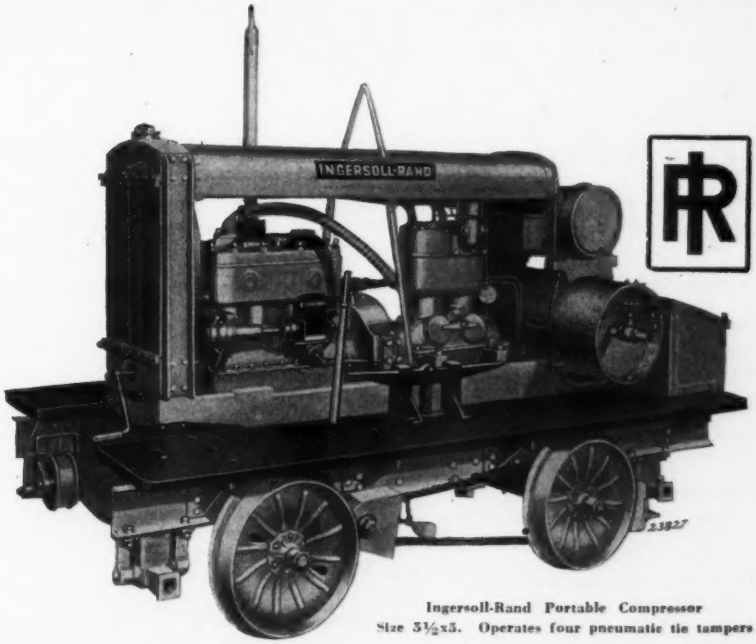
Railway Exchange CHICAGO | 30 Church Street NEW YORK | Railway Exchange ST. LOUIS | 405 W. Forsyth St. JACKSONVILLE | 664 Mission St. SAN FRANCISCO | 75 Evershot Road LONDON

I-R Portable Air Power Units

Ingersoll-Rand Compressors for railway service are designed to operate Tie Tampers, Pneumatic Tools, Sand Blasts, Paint Sprays, etc. These outfits can be successfully and economically used on bridge repair work and on any emergency job where Compressed Air Power is required. Such jobs include the operation of signal lines, of rock drills in tunnel and culvert work, of water pumps, etc.

The units embody all of the highly refined and superior points of construction contained in the well-known Ingersoll-Rand Type 20 Portable Compressors, which are so extensively used by contractors, public utilities, communities, etc. They are without doubt the most highly developed Power Air Compressors built today. Service records of hundreds of these compressors in the railway field characterize them as the most rugged, compact, and efficient plants available.

An Ingersoll-Rand Portable Railroad Compressor is a complete power plant. Nothing is lacking. It is ready to go to work as soon as the fuel, water, and oil are supplied. There are three sizes available, with capacities to operate 4, 8, or 12 Pneumatic Tampers.



Ingersoll-Rand Portable Compressor
Size 5½x5. Operates four pneumatic tie tampers

INGERSOLL-RAND COMPANY, 11 BROADWAY, NEW YORK CITY

Offices in principal cities the world over

For Canada Refer—Canadian Ingersoll-Rand Co., Limited, 260 St. James Street, Montreal, Quebec

228-TT

Ingersoll-Rand

1. Note how easily Armco culverts can be transported. No special equipment for loading or unloading.

2. Armco Culverts can be installed without interruption to traffic. Easy and economical to install.

3. Armco Culvert installed 1910, under 8-ft. fill of sandy soil. Inspected 1922—conditions fect.

Culvert economy

that means lowest cost per year of service

Armco economy begins where the iron is made and continues right through the entire life of the culvert.

Economy in Transportation

The economy with which Armco culverts can be transported is due to their comparative lightness, their compactness and convenient form. No special equipment for loading or unloading is required. The number of cars needed for shipment is reduced in many cases to less than one-third of usual requirements. Another important advantage is Armco's immunity against breakage in transit.

Economy in Placing

Armco culverts are economical to install because of their light weight and simple yet sturdy construction. Any average section can be handled and installed by two ordinary workmen without the use of special equipment. Their self-aligning feature and the simplicity of field connections speed up construction.

ARMCO Ingot Iron

Economy in Service

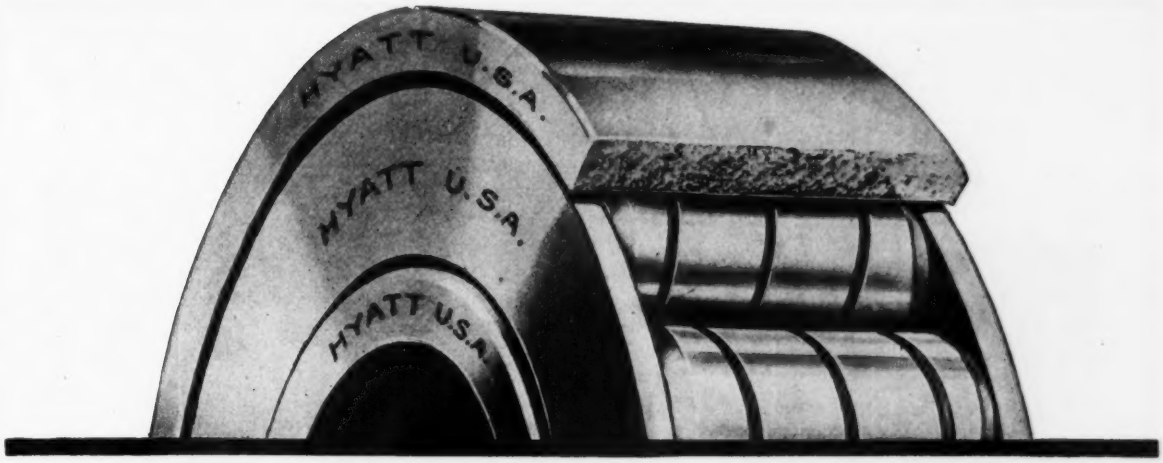
It is in the year-by-year service that Armco economy is most outstanding. Armco culverts assure economy in use because of their long life and low maintenance costs. There is no need for repairs or for periodic realignment of sections because Armco pipe stays put. In case of change of roadbed location Armco culverts can be easily taken out and relocated without loss of value. Above all, investigation of thousands of drainage structures has proved Armco culverts to be unsurpassed in economy in terms of cost per year of service.

Base your judgment of culvert economy on an unbiased investigation of culverts in service in your territory. Armco engineers will gladly suggest a method of procedure.

ARMCO CULVERT & FLUME MFRS. ASSN.
Middletown, Ohio

ARMCO CULVERTS

Consistent performance—because of consistent uniformity



"HYATT U. S. A."

—*a mark of bearing satisfaction*

The inherent advantages of Hyatt design have encouraged close imitation. In the past, when you specified Hyatt Roller Bearings *by name* you usually received genuine Hyatts. Now, as a double precaution, you can tell them by the Hyatt mark which identifies every bearing we make.

While physical appearance might be copied — only genuine Hyatts can give Hyatt results.

The proper selection of raw materials — the workman-like construction — the rigid inspection — the care and thought which goes into the manufacture of Hyatt Bearings cannot be acquired overnight.

Few companies can equal the thirty years' bearing experience, or the engineering and sales co-operation offered by Hyatt. Fewer still can warrant your implicit confidence with such records of performance as Hyatt bearings assure.

Our engineering staff, working with a technical background of more than a third of a century, is at your command for any bearing problems you may have. And the General Motors Corporation, of which Hyatt is an important unit, is behind every contract, promise, and installation we undertake.

It is for your protection, as well as our own, that all genuine Hyatts are die stamped "HYATT U. S. A."

HYATT ROLLER BEARING COMPANY

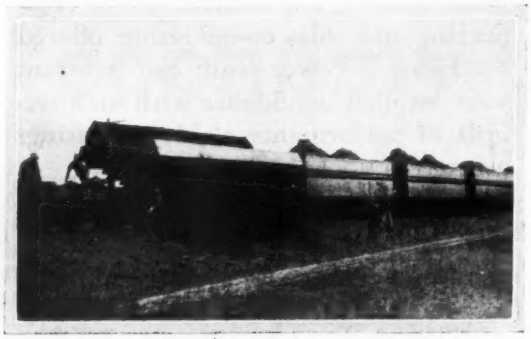
Newark Detroit Chicago San Francisco
Worcester Philadelphia Charlotte
Pittsburgh Cleveland

HYATT

ROLLER BEARINGS

THERE'S A HYATT BUILT TO IMPROVE EVERY BEARING APPLICATION

One of the Seaboard's dirt trains "flushing fills" in Georgia—Western all steel automatic air dump cars with aprons.



Dumping the dirt train in the work of widening shoulders.

The dirt train has dumped its load and is on its way back to the shovel.

Western Dump Car Facts

Will pay for themselves compared with old methods.

Can run at high speed in safety.

Air dumped instantly, **either way.**

Apron helps to clear the ballast.

Can be righted, when desired, **without moving up the train.**

Few castings, very accessible.

Are all-purpose cars for cinders, waste, snow, ditching, bank widening, trestle filling, construction, etc.

Full information on request—and reference to railroad men who are enthusiastic over their performance.

Write to-day.

Western Wheeled Scraper Co.

Founded 1877

Earth and Stone Handling Equipment

AURORA, ILLINOIS

Western

The Only Way
To Measure Tie Value

—is to check up all tie purchases on these six important requirements.

You must have *sound timber* for successful tie preservation, *accurate grading* to secure full size timber, *proper and thorough seasoning* to prevent decay and to get timber ready for preservative, *scientific treatment* to force preservative far into the cells of the timber, *prompt service* to plan maintenance schedules and *permanent interest* to assure quality to purchaser.

International leaves nothing to conjecture—Every tie is a standard specification tie—sound timber—full size and scientifically treated.

A trial order will convince you. Order now. Service in quality, shipment, life and price assured.

2¢6
The International Dating Nail

International Creosoting & Construction Co.

General Offices—Galveston, Texas

International
STANDARD SPECIFICATION TIES

RACOR

SEVEN WORKS
RAMAPO-AJAX-ELLIOT
HILLBURN, NEW YORK
NIAGARA FALLS, N.Y. ·
CHICAGO, ILLINOIS ·
EAST ST. LOUIS, ILL ·
PUEBLO, COLORADO ·
SUPERIOR, WISCONSIN
NIAGARA FALLS, CANADA

HEAVY DUTY HEAT TREATED GUARD RAIL CLAMPS
DROP FORGED RAIL BRACES
ADJUSTABLE RAIL BRACES
EUREKA ADJUSTABLE CLIPS
MANGANESE REINFORCED SWITCH POINTS
RAMAPO AUTOMATIC SAFETY SWITCH STANDS
AJAX MANGANESE ONE-PIECE GUARD RAILS
SWITCHES – FROGS
CROSSINGS – SPECIAL
RAILWAY TRACK WORK

RACOR
TRADE MARK
REGISTERED

Main Office – HILLBURN, NEW YORK
SALES OFFICES AT WORKS, ALSO
30 CHURCH STREET, NEW YORK
McCORMICK BUILDING, CHICAGO

RAMAPO AJAX CORPORATION

KALAMAZOO "CONVERTIBLE"
Motor Car Trailers

A piece of equipment with *two* uses naturally has *double* value. In other words, Kalamazoo Combination Trailers, which can be used for the transportation of either men or materials, are twice as valuable to the maintenance of way man as a "single-purpose" trailer.

With the superstructure mounted, Kalamazoo Trailers serve as extra gang cars. Remove the superstructure—a job of only a few minutes—and you have a flat deck for hauling materials. As a material car, the Kalamazoo Trailer may be used either as a motor car trailer or as a push car.

All Kalamazoo Trailers are equipped with Kalamazoo Improved Reinforced Pressed and Rolled Steel Wheels, 4-Wheel Positive-Action Brakes, Roller Bearings, Draw Bar Head and Draw Bar.

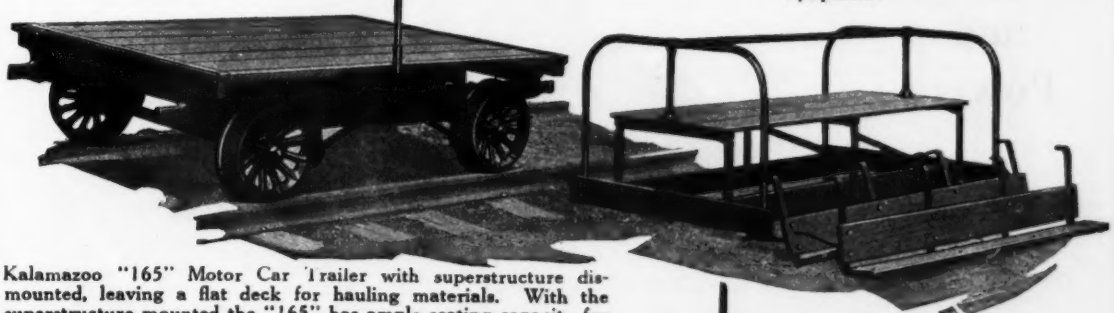
Kalamazoo Railway Supply Company

Kalamazoo Michigan, U. S. A.

New York, Chicago, St. Louis, New Orleans, Denver, Spokane, Seattle, Portland, Ore., Havana, London, Mexico City, Johannesburg, Vancouver, Winnipeg, Montreal.

The Kalamazoo Line What It Means to You

The name Kalamazoo on any Trailer is a guarantee of quality. Every Kalamazoo Trailer embodies the latest in Trailer design and the sturdiest construction — backed by a company which has served the railroads for more than forty years.
We manufacture also a complete line of Motor Cars, Hand Cars, Push Cars, Velocipede Cars, Electric Crossing Gates, Rolled and Pressed Steel Wheels, Wood Center Wheels with Steel Tires, Moore Track Drills, Gauges and Levels, Wood Cattle Guards, Steel Cattle Guards—in fact a complete line of maintenance of way equipment.



Kalamazoo "165" Motor Car Trailer with superstructure dismounted, leaving a flat deck for hauling materials. With the superstructure mounted the "165" has ample seating capacity for 20 men. Kalamazoo "161's" and "43's" are also equipped with demountable superstructures. Seating capacity of the "161," 20 men—of the "43," 24 men.

Kalamazoo Means Service to You

"Rajo" No. 4 for Heavy Terminal Track Work

Keep Two or Three of them on Every Division

KEEPING PACE WITH PROGRESS

Combines Speed and Power

"Rajo" No. 5

The Rail Joint Company 165 Broadway New York City

Applying city street practice to concrete freight yard platforms

1500 lb. concrete in 3 days from a workable 1:2:4 mix. This is the strength obtained in recent tests by American Bureau of Inspection and Tests, Chicago. The same concrete tested 880 lbs. in 24 hours and 1200 lbs. in 48 hours. Using a 1:1½:3 mix and Cal the same tests showed 2200 lb. strength in 3 days.

CAL *will open your yards to traffic in 3 days—*

CAL by accelerating through its chemical action and by permitting the use of a much drier mix gives a "quick strength" concrete that has revolutionized the important work of building state highways and city streets.

Formerly from 10 to 20 days were necessary for the natural curing time of concrete highways—today by the use of CAL roads are opened to full traffic in 3 days and foot traffic in 24 hours. The additional cost for this enormous saving is only about 90c per cubic yard.

These definite advantages and proven economies that have been so clearly demonstrated over a period of years, can well be applied and with equal saving in the construction of concrete freight yard roadways as illustrated above.

Quick use of the finished job, lower construction cost resulting from the re-use of forms are other interesting items of economy which the use of CAL has made possible.

Specify CAL with every shipment of Portland Cement.

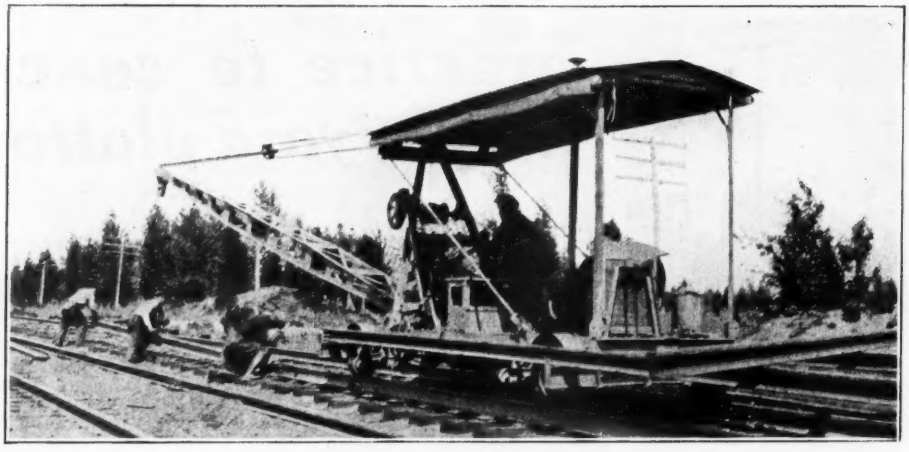
For QUICK HARDENING CONCRETE
for WATERPROOFING FROSTPROOFING AND FATTENING CONCRETE MORTAR STUCCO
USE CAL
Ready for Work
WITH YOUR FAVORITE BRAND OF PORTLAND CEMENT

NORTH AMERICAN CEMENT CORPORATION

Successor to Security Cement and Lime Company

HAGERSTOWN, MD.

NEW YORK WASHINGTON BALTIMORE BOSTON ALBANY



Parsons Rail Crane operating on the Great Northern, near Sand Point, Idaho. Work that would require twenty-three men by hand methods is here being done by the Parsons Rail Crane and four men.

It Has Earned a Place In Your 1927 Budget!

Parsons Rail Crane

has proved its ability to cut 20% to 25% off the cost of laying rail

WHEN a machine can cut 20% to 25% off your present cost of laying rail, that machine deserves a place in your budget for 1927.

And during the track laying season of 1926, the Parsons Rail Crane has clearly demonstrated its ability to save $50 a mile over previous rail-laying costs.

These savings are based on actual cost records. Maintenance of way officials on the transcontinental roads that have been using Parsons Rail Cranes can verify the figures for you.

Compared with hand labor, the savings made by the Rail Crane are tremendous. In laying 140-pound rail, the Rail Crane replaces from eighteen to twenty-two men. And compared with any other rail laying equipment, the Rail Crane has outstanding advantages in Range, in Safety, and in Economy.

Write for Bulletin 26-C, giving detailed specifications of the Parsons Rail Crane. Also ask for a list of officials who have been using Rail Cranes. Get all the facts. They will show you how to cut the cost of your track-laying program for this coming year.

The PARSONS COMPANY
Newton, Iowa, U. S. A.

PARSONS RAIL CRANE

DOES THE WORK OF 10 TO 22 MEN

The Parsons Rail Crane requires a smaller capital investment than any machine of near its capacity.

PREVENT TIE CUTTING
THE Lundie Tie Plate, under the most severe conditions, over a long period of time, has proven itself to be an *economic* device of superior value.
Its *scientific design* prevents cutting a single fibre of the tie, while holding track to rigid gauge.
The Lundie Engineering Corporation
285 Madison Avenue, New York
166 West Jackson Boulevard, Chicago
LUNDIE TIE PLATE

THE American" type DSMD centrifugal pump is a horizontal split shell, single stage, double suction, centrifugal pump furnished with bronze enclosed impeller, bronze labyrinth wearing rings, bronze shaft sleeves and bronze split glands.

Pump is mounted on extended cast iron base to receive motor and is provided with flexible coupling of the pin and bushing type for direct connection to motor.

Pump is of the double suction type and is built in sizes from 2" to 42" and for designed heads up to 250' depending upon size and capacity.

The bearings of the pump are entirely separate from the stuffing boxes which eliminates the possibility of any grit or water in the bearing. The oil reservoirs in the bearing are large, furnishing an ample supply of oil. The stuffing boxes are water sealed so as to insure tight packing without excessive pressure for friction on the revolving shaft.

THE AMERICAN WELL WORKS

Branch Offices:
Chicago, Ill., First Natl. Bank Bldg.
Milwaukee, Wis.
Wisconsin National Bank Bldg.
New York, N. Y.... 165 Broadway
Dallas, Texas
Western Indemnity Bldg.
San Francisco, Calif., 635 Mission St.

District Sales Agencies:
Philadelphia, Pa.
Pittsburgh, Pa.
Cleveland, Ohio
Detroit, Mich.
St. Paul, Minn.
Omaha, Nebr.
St. Louis, Mo.
Kansas City, Mo.
Joplin, Mo.
Atlanta, Ga.
Birmingham, Ala.
Jacksonville, Fla.
New Orleans, La.
Roswell, N. Mex.
Denver, Colo.
Salt Lake City, Utah
Phoenix, Ariz.
Los Angeles, Calif.
Charlotte, N. C.
Calgary, Alta., Can.

General Office and Works:
AURORA, ILL.

Why we use Prest-O-Lite dissolved acetylene

In oxy-acetylene welding and cutting, fuel value means much more than quantity of heat per pound of fuel. It means that the fuel—acetylene—must be uniform and always available.

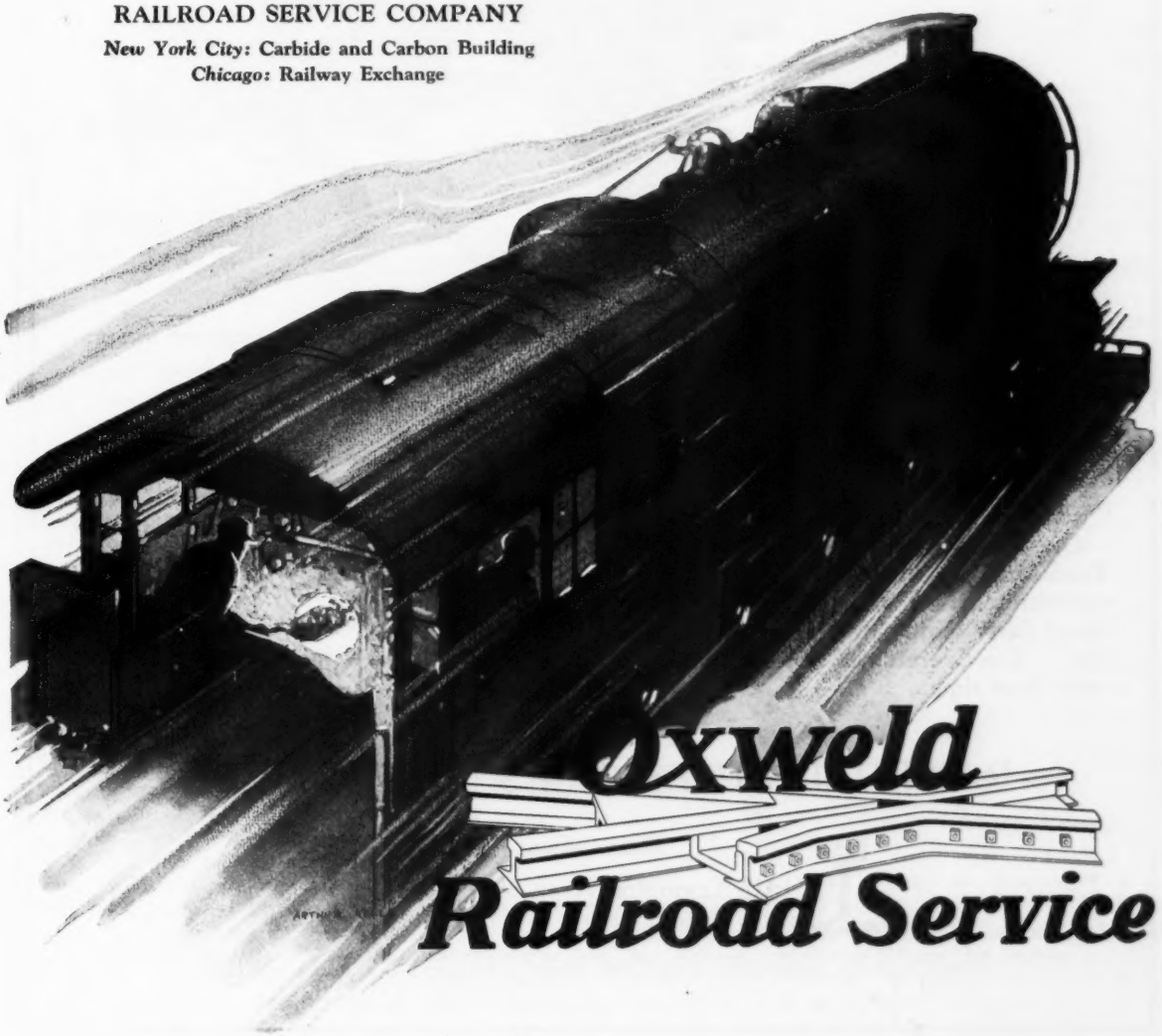
For all portable operations, Oxweld Railroad Service uses Prest-O-Lite dissolved acetylene which has been manufactured for 21 years and is now produced in 31 separate plants located at important railroad junction points.

But the most important factor in fuel value is economy in its use. That is a part of Oxweld Railroad Service. It means a thorough knowledge of what can be accomplished for each railroad by oxy-acetylene welding and cutting. It means the adaptation of oxy-acetylene technique to each special job.

It is possible only through a competent progressive staff, like that of Oxweld Railroad Service, which has been developing for 14 years and which now numbers more than 200 instructors.

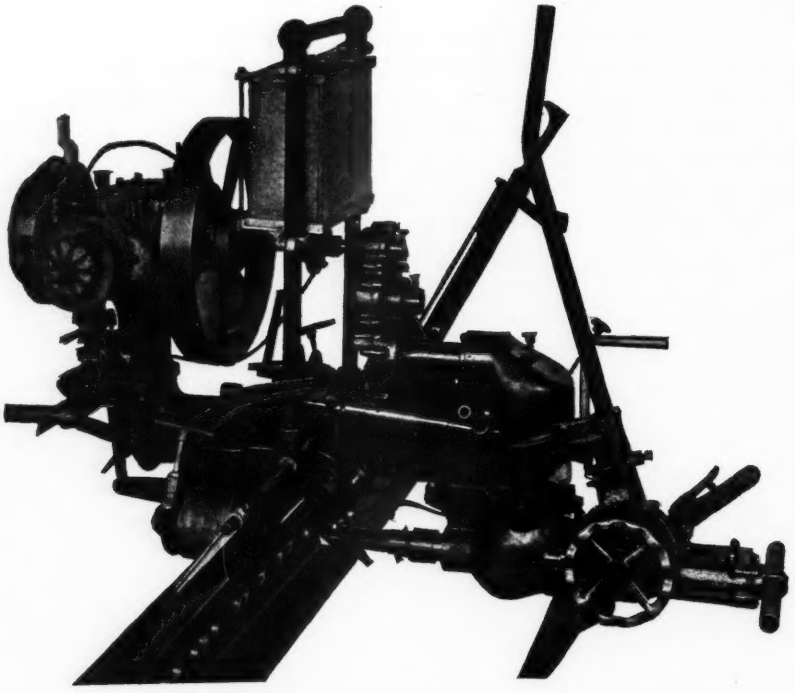
THE OXWELD
RAILROAD SERVICE COMPANY

New York City: Carbide and Carbon Building
Chicago: Railway Exchange



EVERETT POWER M-W TRACK DRILL

You cannot afford to drill bolt holes by hand.



(Patents Issued and Pending)

The **Everett Power M-W Track Drill** is similar in general design to the Everett Power Bonding Drill which, during the past four years, has made such **remarkable records for economy** in labor and drill consumption that practically every large railroad is now equipped with them.

One man with the **Everett Power M-W Track Drill** can drill a bolt hole in less than **one minute** which previously took **two men about thirty minutes** with a hand operated drill. The **Everett** will **pay for itself in a very short time.**

The **reduction of time required** to complete the work will, in many cases, be an even more important factor.

The **Everett Power M-W Track Drill** is designed to drill up to 1½ inch holes through the web of rails **any size** from 65 to 150 pounds. It is also designed to drill web of rail through **splice bars.** It will drill rail when in track or **out** of track. It will drill holes to within 2¼ inches **from end** of rail with **no other** rail adjoining.

RAILROAD ACCESSORIES CORPORATION

Main Office:
415 Lexington Ave., New York
Factory: Albany, New York

Siemens and General Electric Railway Signal Co., Ltd., 21 Great Queen St., Kingsway, London, Eng., Agents for Great Britain, So. Africa, Australia, New Zealand, India Argentine Republic, France, Belgium and China

Railway
Engineering and Maintenance

Volume 22 September, 1926 Number 9

WHY NOT DO SOMETHING ABOUT IT?

MECHANICAL painting, or the application of coatings to surfaces by means of a sprayer, has been practiced for years in various industries. More recently it has been applied to a considerable extent by the railroads in the painting of cars, but in the bridge and building department it has been like the weather—talked about but little done about it. However, there are exceptions to all rules and along with a few other roads the New York, New Haven & Hartford has really done something about it. Beginning in an experimental way in 1923 with one spray outfit, it has added to its complement of machines until it now has fourteen, one for each division and four extra.

Spray painting has been in practice for a sufficient number of years to prove that coatings applied by the sprayer give good service. The question of the use of the sprayer in railway bridge and building work has rather been that of the practicability of utilizing the equipment profitably under the conditions imposed on the railroads. The acquisition of fourteen spray machines by the New Haven in a piecemeal fashion during a period of three years is a demonstration that the machines have been used, for additional purchases would not have been made if the machines already owned were not being usefully employed, and the article on page 355 describes how they are used and the results that are being obtained.

As will be noted in this article, the officers of the New Haven realize that spray painting has certain limitations and that in consequence some work must continue to be done with brushes. However, the employment of fourteen sets of paint sprayers demonstrates effectively that the road has plenty of work that can be done with them at a material saving. Isn't it time for more of the roads to talk less and do more about spray painting in the bridge and building department?

THE COST OF LAYING RAIL

INCLUDING both new and relayer rail, more than 4,000,000 tons are laid in tracks each year. The direct labor charge for this work exceeds $15,000,000, an amount sufficiently large to warrant the closest supervision, while the labor charge for this account on numerous individual roads exceeds a half million dollars. For this reason the plan developed by the Chicago, Milwaukee & St. Paul for the laying of its rail this year, as described on page 359, while not entirely novel, has several points to commend it.

In the first place, the rail laying operations are organized on the basis of a general superintendent's district, rather than a division, thereby concentrating the work of from ten to twenty gangs into four. This concentration enables supervisory officers to watch the work more closely and to apply such measures as will expedite it. Furthermore, with the season's work ahead of it and with large forces, each gang can be more highly organized and the men become more proficient than is possible with many smaller gangs, each employed for a short time. Not the least important advantage is the fact that the work is spread more uniformly throughout the active working season, thereby simplifying the problem of the stores department in supplying the material and also distributing the maintenance charges over a longer period.

The danger of large gangs is the difficulty of securing adequate supervision. The St. Paul has recognized this by placing each of these gangs in charge of a roadmaster carefully selected for this purpose and devoting his entire time to the work. A gang of 125 men involves a pay roll expenditure of nearly $500 per day, an amount sufficiently large to afford opportunity for heavy loss. To avoid this possibility, the St. Paul gives each of these roadmasters three or four foremen for specific portions of the work.

Attractive as any plan may appear, the real test of its practicability is the results that it produces. The St. Paul's rail laying organization has shown a saving of 20 per cent in the cost of laying rail as compared with former methods, an amount sufficiently large to justify a continuation of the plan on the St. Paul and to warrant its serious consideration on other roads.

ADEQUATE TRAINING IS A NECESSITY

"THE majority of the foremen who are doing work wrong have not been properly instructed." In this positive manner J. V. Neubert, engineer maintenance of way of the New York Central, Buffalo and East, places the responsibility for the efficiency with which maintenance foremen conduct their work on their supervisory officers in the conclusion of his review of the work of maintaining an important railway abstracted on page 357. "Too many orders," he said, "are being transmitted by letter. A spoken word is worth more than twenty by letter," thus indicating his idea of the way in which training should be conducted.

Maintenance of way work is done in the field and it is here that the money is spent. It is of necessity scattered, rendering supervision difficult. The nature of the work is such that many conditions arise which require immediate action without opportunity to consult with others of greater experience. Furthermore, there is no rule of thumb book of instructions to which one can refer for an answer. The work is constantly changing in character by reason of the increasing amount of new equipment and materials available, while the demands of traffic are steadily becoming

more exacting. All of these conditions illustrate the necessity that the men on the firing line be adequately trained in order that their work may be conducted at all times in accordance with safe and efficient practices.

The success of any supervisory officer is measured by the efficiency of his forces. The training of these men is, therefore, his first and most important duty. This is not completed in a day, but is a long continuing process, having as its objective the transmission to his assistants of one's ideas so thoroughly that they carry on their work in all respects as he would. That system maintenance of way officer is most successful whose division engineers handle the work on their respective territories in entire harmony with the system program. Likewise, that division engineer obtains the best results when his supervisors work to a common objective. In even greater degree, that supervisor serves his road best whose foremen direct the work of their gangs most efficiently in accordance with the standards of the road.

A maintenance foreman's responsibility is two-fold. First, his work must be so conducted at all times as to insure safety of travel. Second only to that, it should be handled as economically as possible. It is to the credit of maintenance foremen and of the officers who supervise and who have trained these men that there is little cause for complaint with reference to the first requirement. It requires little investigation, however, to demonstrate that marked economies are possible hrough improvement in the methods of handling many tasks. If left to themselves there will be almost as many ways of doing a task as there are foremen. Yet there is some one best way. It is the duty of the supervisor to determine this best way and then to train his foreman in that way. This requires that the supervisor himself has an intimate knowledge of each detail of the work handled by his foremen and that he himself knows the best methods for doing this work. It then requires painstaking effort, patience and close supervision to train his foremen in this method. However, close supervision pays, and more direct contact and less writing of letters will bring results.

WHAT IS YOUR TITLE?

AN AMERICAN railway officer traveling in Europe, unless he has given considerable time to the study of European railroads, finds himself confused by the titles of railway officers until he had learned, for example, that a permanent way inspector is the equivalent of an American roadmaster or supervisor. But imagine the predicament of a European railway officer who is studying railway organization in America. After visiting one railway and becoming familiar with its organization, he would congratulate himself on the progress he was making in his investigation. He will probably put down in his notes that the division maintenance of way officer is known as a roadmaster and that he has under his direction three or four supervisors in charge of sub-divisions and that there is a division officer in charge of bridge and building work known as a bridge and building supervisor.

Imagine his confusion when, on visiting another road, he learns that the sub-division track officer is designated as a roadmaster and that the bridge and building officer is known as a master carpenter. In fact, if he continued his studies, he would learn that with respect to the bridge and building officers there are at least seven different titles for men having substantially the same duties.

The only explanation that could be offered him for this multiplicity of titles is that, like Topsy, "they just growed," and that thus far at least, no concerted effort has been made to secure a greater uniformity in designations. Because of this confusion of titles, men who speak from the floor of the Roadmasters' convention almost invariably refer to "the roadmaster or supervisor" because there is no single all-inclusive term. At bridge and building conventions the speaker must limit himself to one term, usually "supervisor of bridges and buildings," trusting that he will be understood, because there are too many names for him to mention them all.

Standardization or changes in standards of titles, unlike measures for the simplification of practices or changes in standards of fixed property, machinery, tools, etc., costs but little. In fact, once an agreement is reached among the railroads, the printing of a few brief circulars would cover all the expense involved. The only objection to the change is man's inherent resistance to the breaking of established precedents.

MODERN TURNTABLES

IT OFTEN happens that an old device is superseded by a new one which embraces an invention so simple as to lead one to say, "I wonder why some one didn't think of that before." The chances are that in many cases of this kind some one had previously suggested the idea, but progress in science had not yet reached the point where the suggestion could be applied in a practical way. The idea of the automobile, for example, which is as old as that of the locomotive, had to wait until the gasoline engine was developed before it could be put into practical use. Thus, it was with the types of turnable which carry loads on the end trucks while being turned. Nothing can be simpler, yet there is a very good reason why such turntables could not be used until the present time.

When the first turntable was built, the most important requirement was that it was easy to turn since it had to be turned by hand. Consequently, the balanced or pivot-bearing type, which imposes the minimum friction moment to turning, was the only practical type, and until electric power was generally available under conditions that offered only remote possibility of interrupted service, it was a waste of time to consider any type of turntable which imposed any increase in the resistance to turning.

The turning of twin span, or continuous turntables, which apply loads to the end trucks while turning, requires more power than is necessary for the turning of a balanced type of table. However, the extra cost for the larger motors and the added operating costs are entirely offset by the many advantages of the newer types, to which attention has been emphatically directed by the manufacturers.

Among the marked advantages of the newer types is the pronounced decrease in the requirements of the center bearing. Not only is the weight of a twin span or continuous type turntable much less than that of a balanced turntable of the same length, but the load of both the turntable and the locomotive is distributed to three points of support instead of to the center alone during the operation of turning as is the case with the balanced type. This feature should appeal particularly to the maintenance officer because of the many problems of center-bearing maintenance which are constantly being imposed.

Another interesting point has been raised by P. G. Lang, Jr., as outlined in a letter in an adjoining column, with respect to the requirements of the circle rail. At

first thought one would suppose that these are more severe when the circle rail takes loads during turning, than is the case in a balanced table wherein the circle rail is subjected to loads only when the locomotive is entering or leaving the table. However, as Mr. Lang points out, the circle rail of a balanced type turntable is subjected to impacts which are not encountered in a type of table in which the end truck wheels are always in contact with the circle rail and in which the rails of the track on the turntable can readily be kept on the same level as those of the radial tracks.

A TRACK MAN'S INTEREST IN THE SEASONING OF TIES

IS THE track man interested in ties? Since they comprise a very important element of his track structure and constitute his largest material charge, it goes without question that he is. Yet is he doing all that he can to conserve this expenditure? Much attention has been directed in recent years to the need for care in the handling of ties with the result that their unnecessary destruction by the use of picks in insertion, by rail cutting and by undue adzing, has been greatly reduced. There is, however, another and equally important phase of the problem to which track men have as yet given little attention, namely, the care of the tie prior to its delivery to them for insertion.

No precautions in the handling of a tie after its receipt on a section can overcome the loss of life resulting from carelessness in manufacture, in seasoning or in treatment. Life lost there is lost permanently. It is, therefore, equally as important that the tie be in the best practical condition when it reaches the track as that precautions be adopted there that may best protect it.

Of particular importance is the prevention of infection of the timber by decay-producing germs during the period of seasoning. As described on page 344 of this issue, there is still room for much improvement in the practices of many roads in this respect. This condition results in large measure from the lack of realization of the extent of the deterioration that the timber undergoes as a result of these lax practices. It is here that the track man can help.

It is not within the province of the foreman, the supervisor or the division engineer to formulate the practices under which ties are seasoned. They are the men, however, who have first-hand knowledge of the condition of the ties as they go into the track and of the service they render. They are also the men who note the reasons for their removal and the conditions that limit their life. By calling attention to deficiencies in the present methods of handling ties that are resulting in the delivery to them of timber in other than perfect condition, they can do much to focus attention on those practices that are leading to these conditions and bring about their elimination.

No small part of the responsibility for the continuation of those practices in the early handling of ties which are reducing their life rests with the trackmen because of their long established practice of accepting materials given them without question and without comment. That employee serves his company best who brings to the attention of his superior officers tactfully through the proper channels those conditions that constitute drains on the revenues of his road.

POTATO RAILROAD.—A railroad devoted entirely to the transportation of potatoes, with 20 miles of main track, is one of the curiosities of transportation in England.

Letters to the Editor

SUPPORT FOR TURNTABLE CIRCLE RAILS

Baltimore, Md.

To the Editor:

A great deal of discussion and resulting confusion appears to have developed in connection with the recent use of three-point support turntables, which, at the present time, are very extensively superseding the balanced type table. The underlying thought apparently is that it is absolutely essential in the three-point support type table that the circle rail be held at a uniform elevation throughout, and that it must be rigidly maintained at that elevation. Balanced type tables have always been of very rigid design, in order to reduce the deflection. Even so, the end of a balanced type table, when an engine is coming on the table, is higher than the approach rail, with the result that an excessive impact or pounding is set up, working a hardship on the end trucks, and requiring a circle rail with substantial support. A three-point support table has its ends bearing on the circle rail at all times. Therefore, the top of the rail on the turntable can be made at the same elevation as the top of the approach rail, this factor very materially reducing the impact when an engine runs onto the turntable.

Balanced type tables are designed to be stiff, in order to reduce the reflection, and based on the theory that practically all of the load will be carried by the center when turning, they have been equipped with comparatively light tractors; therefore, if, in a balanced type table, the circle rail is not maintained at a uniform elevation, difficulty will be encountered, due to the excessive bearing of the ends of the table on the circle rail, which the comparatively light tractor will not be able to overcome.

There are on the market at the present time two types of three-point support turntables, one the so-called "twin-span," the other a continuous girder. When compared with the usual balanced type turntable both types are extremely flexible. If there is any advantage whatsoever in the twin-span type, then the reactions at the ends and at the center remain the same, whether or not the circle rail is held at a uniform elevation, that is, within reasonable limits. Experience indicates further that the same can be said of the continuous type table, since it is extremely flexible. As a measure of the flexibility of these tables, it is to be noted that a difference in elevation of ½ in. can be produced by an uplift of 6,000 lb. at the circle rail, which is a very small proportion of the total vertical reaction at that point. Consequently, it would seem that, considering all factors, it is not so necessary to secure and maintain uniform elevation of the circle rail in the three-point support type turntable as in the balanced type turntable. Certainly, the whole question depends on the degree of flexibility obtained. If an absolutely free joint was obtained in the three-point support type table at the center that is, a hinged or pin joint, then the question of maintaining uniform elevation of the circle rail would not enter into the discussion.

Therefore, considering all factors, it appears that it is more essential for satisfactory operation that a uniform elevation of the circle rail be maintained at all times for the balanced than for the three-point support type turntable.

P. G. LANG, JR.,
Engineer of Bridges, Baltimore & Ohio.

How Objectionable Is Decay in Ties?

Present Standards of Inspection and Methods of Seasoning Leave Much to be Desired on Many Roads

By ELMER T. HOWSON
Editor, Railway Engineering and Maintenance

ARE the railways interested in the quality of the ties furnished them? Is it of concern to them that the ties are well made and properly graded? Should they show any interest in the place and the manner of their seasoning? In other words, is a tie merely a tie or do they differ in quality and in value with the manner of their handling? These questions may not seem worthy of serious consideration, yet only the most casual investigation of the manner in which millions of ties are still being bought will show that this is a matter of the livest concern to the railways.

At the present time the roads are spending more than $200,000,000 annually for approximately 100,000,000 cross ties for insertion in their tracks, including the cost of timber, treatment, transportation and insertion. This is a larger amount than is spent for any other single class of material used in maintenance of way work. It constitutes a tax of $500 on every mile of track maintained and as time goes on

An Evidence of Over-grading—The Inspector Found No Size 1 or Size 2 Ties in This Entire Yard

these costs per installed tie are steadily increasing. Furthermore, the service demanded of these ties is steadily becoming more severe. Wheel loads are heavier, traffic more dense and standards of track maintenance more exacting. At the same time, the diminishing stands of timber are making it necessary to utilize less resistant woods.

To insure that the ties will meet the requirements of service adequately, specifications have been prepared by the American Railway Engineering Association and approved by the American Railway Association, setting forth the minimum requirements. These specifications, first introduced in 1918, have met with increasing favor from year to year until they are now in force on a majority of the roads and may be said to be the standard cross tie specifications of the country. These specifications fix the dimensions of the ties acceptable for the different grades or "sizes." They set forth the requirements of manufacture and they limit the amount of decay permissible.

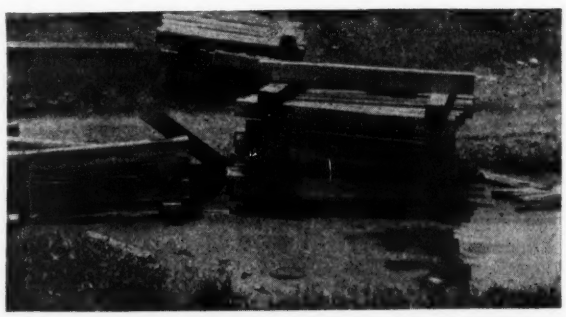
A uniform specification, however, is not enough; to be effective it must be enforced, for no specification is better than the inspection that accompanies it. It is here that the widest discrepancy arises and the most serious shortcomings are found, for on many roads which are in theory buying ties in accordance with the A. R. E. A. specifications the inspection deviates so far from the specifications as to constitute

Seasoning Among the Weeds and Submerged in Every Freshet

practical nullification of them. It is through laxity and irregularity in inspection also that demoralization in the tie producing industry is created, to the ultimate loss of the railways which constitute practically the only outlet for cross ties.

The most pronounced deficiencies in inspection are found in the over-grading of ties and in the disregard of evidences of decay. There is little justification for either if inspectors are employed of the experience that the importance of their work warrants. As to over-grading, the specifications are definite in fixing the dimensions for each grade or "size," yet over-grading is so prevalent in certain tie producing areas and so much more pronounced among the inspectors of these roads than of others that it is evident that it reflects the policy of some roads rather than the shortcomings of individual inspectors.

In an investigation made by the writer in some of the largest tie producing areas of the country three years ago, over-grading was found to be common in ties inspected for many roads as was set forth in an



Ties Seasoning in the Mud

article in *Railway Engineering and Maintenance* for July, 1923. In a similar investigation in the same territories made during the last few weeks the same conditions were noticed, although less pronounced. On some roads whose inspections showed considerable

deviation from specifications three years ago, little was found to criticize as to grading this year, the inspection showing a marked improvement. In other cases similar but less marked improvement was noted with opportunities still remaining for considerable further progress. In still other cases no change was found, the inspection still being characterized by flagrant deviations from specifications. When it is realized that over-grading of a tie by one "size" increases its price ten cents or more the loss to a railroad from wilful over-grading, which not infrequently averages two grades or more, can be seen.

Decay a Serious Factor

Since decay is the greatest enemy of ties and since by far the majority of the ties removed from track come out because of decay, it would appear self-evident that the strictest scrutiny should be given ties to detect and eliminate those showing indications of decay. Yet in many instances ties are accepted readily with a "little" decay, even though it is known that this will spread rapidly throughout the tie and

The Results of Improper Seasoning Before Treatment—Decayed Ties. Note Pocket Knives Imbedded in Doty Wood. Three of These Ties Broke in Unloading

even to other ties during the seasoning period. In many instances the protection afforded by the specifications in the ban against decay (requiring that "all ties shall be free from any defects that may impair their strength or durability as cross ties such as decay," etc.) is discarded on the plea that the ties, having been cut, should be accepted as a conservation measure to prevent the timber from being wasted. This argument ignores the fact that just as long as ties are accepted with decay evident, others of this condition will be produced and offered for sale. In other words, the acceptance of a few decayed ties merely encourages the production and delivery of others.

If it were possible to determine the number of ties whose service life is reduced through decay prior to their insertion in track and to measure this reduction in the life in tie years the figure would be so startling and the drain on railway revenues would be seen to be so large that no further argument for strict enforcement of the specifications would be necessary. But even in the absence of definite data the subject deserves careful consideration because of the drain that is continuing from year to year.

While certain species of decay originate in the tree before it is felled by far the larger loss arises from faulty handling of the timber during the period of seasoning. This is due in large measure to a lack of appreciation of the rapidity with which timber deteriorates under adverse conditions. It is due also largely to the indifference of many of the railways to evidences of decay when inspecting ties incident to their purchase. It is equally evident in the careless-

A Tie Seasoning Yard Overrun with Weeds, Typical of Many Localities

ness with which they permit their ties to season after they have accepted and paid for them.

It is commonly recognized that moisture and vegetation, which are prevalent in the forest, are highly conducive to decay, while sunlight and air are essential to proper seasoning. For this reason, those roads and those commercial treating companies which are giving the closest attention to the care of their timber provide seasoning yards adjacent to their treating plants which are carefully graded to provide thorough drainage and kept free from all vegetation by constant weeding. It is the further practice of these organizations to remove their ties from the woods to these yards at the earliest possible moment before they become infected with decay producing organisms. No road has studied the behavior of its ties more thoroughly than the Santa Fe. As a result, no road is more exacting in its insistence that its ties be removed from the woods to the seasoning yards promptly. One commercial company which has also given this subject the most careful attention operates under a policy of removing most of its ties from the

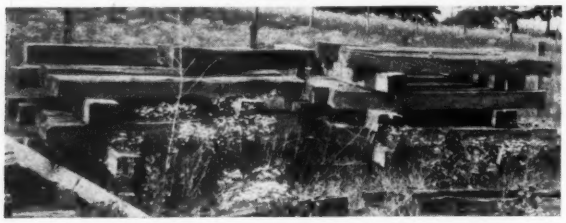
Well Manufactured Ties Deteriorating Under Adverse Seasoning Conditions

woods within two weeks of the time of their cutting and all within a month.

This transfer involves an extra handling and adds perhaps three to five cents to the cost of a tie. To avoid this expense not a few roads and commercial treating companies are allowing their ties to be stacked on the right of way for the period of six months to a year required for seasoning, with vege-

tation growing up through the piles and exposing them to decay.

To make matters still worse, little or no attention is paid to drainage and in many instances ties are being piled on land subject to overflow, another condition conducive to early and rapid decay. A further consideration of no small importance is the fact that with centralized storage it is possible to keep a close check on the rate of seasoning of various lots of ties by means of moisture determinations and to load them on trams for treatment as soon as they are ready, while it is not practical to so watch ties on the



A Hardy Growth of Weeds Promotes Decay

line and they are commonly loaded according to arbitrary rules or to the convenience of local officers. It is not infrequent for the proper seasoning period to be disregarded entirely with ties of commercial companies and for the time of loading to be governed by the receipt of orders, which condition frequently results in ties being left on the ground long after they have been seasoned adequately, particularly in times of tie surplus or limited demand.

Carelessness in Stacking Ties

A further precaution insisted on by the more careful roads requires that, as stipulated in the specifications, the ties be "stacked in alternate layers of two and seven, the bottom layer to consist of two ties left at least six inches above the ground." Such stacking permits the air to circulate freely about the ties while they are piled awaiting shipment to the central seasoning yard. Yet many ties are stacked closely together in ricks and are accepted when so stacked, even though it is recognized that this practice not only makes accurate inspection and grading impossible, but is highly conducive to decay. This practice is tolerated merely because the woodsmen find it

Close Piling Promotes Decay and Renders Accurate Inspection Impossible

easier to unload them this way than to stack them more carefully in regular piles.

Is this care worth while? It costs money to secure and grade a central storage yard. It costs money for the extra handling necessary to transfer ties from the right of way to the storage yard. It also costs money to pile the ties openly when they are delivered on the right of way. All of these costs may aggregate as much as ten cents per tie. It should be considered, however, that it costs as much to treat, transport and install a defective tie as a perfect one, while the service life is materially shortened. The added care in handling the tie to protect it properly against decay may increase its cost in the track five per cent while neglect of these provisions may reduce its life in the track by 25 or even 50 per cent. It does not require much of an analysis to show that only a relatively small shortening of life is required to offset the increase in the cost of handling. That exposure on the right of way results in such loss of life is self evident.

Much stress is placed today on the necessity for the conservation of our timber resources. This is advanced as an argument for the use of ties that do not comply with the specifications. It is a far stronger argument for the adoption of those measures that will prevent the deterioration of timber cut for ties and secure from this timber the maximum life in track, thereby postponing as long as possible the necessity of cutting other timber to replace it. True conservation strikes at the elimination of every unnecessary loss in timber.

What is the reason that carelessness is tolerated in the seasoning of timber? As far as the railways are concerned it is due in large measure to a mistaken idea of economy, fostered by a lack of realization of the danger incurred by exposure. With ties in the

The Bottom Three or Four Tiers of These Piles Are Submerged After Every Storm

hands of commercial companies the same condition exists to some extent, supplemented by the very natural reaction that in the pressure of competition these companies are not inclined to adopt more exacting precautions than are required by their patrons.

Somebody Is Getting Them

That many ties are being shipped to treating plants and treated in which decay is far advanced can be seen from an inspection of operations in any of the tie producing areas. A partial explanation of the reason for this condition is afforded by the laconic statement of a representative of a commercial company supervising the loading of some of these ties that "you can't tell it when they're treated." When such ties continue to be shipped in quantity month after month it is evident that "somebody is getting them" and that they are going into tracks where they will require renewal prematurely. Such a condition is an indictment of the conditions under which the railways buy materials. As such it constitutes a challenge to engineering officers who use the ties and to whose accounts they are charged and to purchasing officers who formulate the inspection policy and whose representatives accept the ties.

"Master Carpenter" Was an Appropriate Title in the Days of the Howe Truss

Bridge and Building Supervisors or Master Carpenters?

Investigation Discloses Unfortunate Lack of Uniformity in the Designations Applied to These Officers on Various Railroads

ONE by-product of the business and social contracts of members of the maintenance of way and engineering departments at meetings of the various associations in this field has been the centering of attention on the lack of uniformity in the titles by which officers of the maintenance of way and engineering departments are designated on the various railroads. The term assistant engineer, for example, may mean much or little, depending upon the usage of the particular road. Roadmaster and track supervisor are in some cases synonymous terms; in other cases one designation is superior to the other. But by far the greatest variety in terminology is observed in the designations of the supervisory officers in immediate charge of bridge and building work who in many cases are responsible also for the maintenance of water service facilities, if not also the operation of the plants.

Among the titles applied to railway officers of this class are: Supervisor of bridges and buildings, superintendent of bridges and buildings, master carpenter, chief carpenter, bridge and building master, general foreman of bridges and buildings, supervisor of structures, supervisor of bridges, buildings and water service. Other variations of designation are introduced by the use of the terms in reverse order as bridge and building supervisor in place of supervisor of bridges and buildings. These latter variations are of course of no consequence and are ignored in the discussion which follows.

It might be argued that differences in the plans of organization under which bridge and building work is conducted would offer an explanation for the variations in titles and it is true that such variations obtain. For example, certain roads segregate bridge maintenance work from that on buildings. This is true of the Atlantic Coast Line, the Michigan Central and the New York Central. Naturally, on these roads the plan of organization provides for both supervisors of bridges and supervisors of buildings or some similar designation which distinguishes between bridge and building work. On the Chicago, Milwaukee & St. Paul the term "chief carpenter" is applied to the supervisory officer in charge of bridge and building maintenance except the repair and erection of steel bridges and concrete work, these two phases of structures work, which are carried on extensively on that railroad by company forces, being under the direction of other officers.

In general, the various terms may be said to be interchangeable. On one road, however, the Chicago, Burlington & Quincy, the term "master carpenter" is used to designate the division bridge and building officer, the terms "supervisor of buildings" and "supervisor of bridges" are applied to general officers on the western lines of the Burlington, while the term "superintendent of bridges" designates a system field officer on the staff of the bridge engineer. This latter term has a similar significance on the Illinois Central.

A further source of confusion is to be found on a few roads which observe one designation for the bridge and building officer on one division, and use another term on another division as, in one case, where the maintenance of bridges and buildings as well as tracks is under the direction of a roadmaster.

On the whole, however, most railroads, whether organized on the department or divisional plans, provide for the supervision of gangs employed in bridge and building work under the direction of a division or sub-division supervisory officer. Some of these men handle minor steel erection work, more or less concrete construction and the repair and operation of water service facilities. Others are relieved of some of this work, but, in general, their primary responsibility—to insure the safe condition of bridges and the proper maintenance of buildings through the conduct of inspections and the supervision of repair

gangs—is substantially the same on all roads regardless of the titles by which they are known. However, to ascertain whether these variations in duties have any bearing on the titles used, a questionnaire was sent to the chief engineers or engineers maintenance of way of 65 representative railroads designed to afford specific facts concerning the titles and duties of the supervisory officers in charge of bridge and building work.

Fifty-three replies were received, and after eliminating from these, the replies from railroads observing a highly specialized character of organization for bridge and building work, there were 47 replies on which the organization follows the prevailing rule. namely, that of conducting the maintenance of bridges and buildings through the agency of division or sub-division supervisory officers responsible for both. Of these 47 roads, 27 have supervisors of bridges and buildings, 10 have master carpenters, 4 have superintendents of bridges and buildings, 3 have general foremen of bridges and buildings, 2 have bridge and building masters, and 1 has supervisors of structures.

The variation in the extent of their duties is shown in the two tables below. Table I shows the extent of the responsibilities of these men by giving the number of roads on which the man of each title is

Table I—Duties of Supervisory Officer in Charge of Bridge and Building Maintenance

	Number of Roads				
	Buildings, Wood and Masonry Bridges	Steel Erection	Water Service Maintenance	Water Station Operation	Painting
Supervisor of bridges and buildings	27	10	20	18	26
Master carpenter	10	3	8	8	9
Superintendent of bridges and buildings	4	2	3	3	4
General foreman	3	0	3	3	3
Bridge and building master	2	2	2*	2*	2*
Supervisor of structures	1	1	1	1	1

*On one road only part of water service and painting is handled by bridge and building masters.

responsible for each class of work. Table II presents the information in the reverse order by giving the number of roads on which the men of each title are relieved of certain classes of work.

From these tables it is seen that on only a few roads are the supervisory officers given charge of all work relating to the maintenance of bridges and buildings and the maintenance and operation of water service facilities. Of course, insofar as it concerns steel erection it is a fact that only a relatively small number of roads are organized and equipped to do more than a very minor part of steel bridge erection, but in general the practice of those roads which do any amount of bridge erection with company forces is to conduct this work by system gangs independent of the division maintenance officers. With the growing tendency to accord special attention to water service problems, there has been a movement toward the placing of this work in the hands of a special organization, but as these tables show, it is still conducted largely under the direction of the bridge and building supervisory officers on most roads.

One variation which it was not found practicable to bring out clearly in the tables is that which concerns the handling of concrete work. Some roads contract practically all concrete construction except that required for relatively unimportant structures, while others do a large part of it with company forces. In some cases the roads depend upon gangs under the supervision of the bridge and building supervisor, while on others the larger projects are handled by special floating concrete gangs.

With all these variations in organization, it is clear that differences in the designations of the officers in charge of bridge and building work bear no relation to the extent of their authority. Furthermore, it is well to keep in mind that regardless of these variations in scope of authority or responsibility, all of these men, no matter what their titles may be, are held responsible for the physical condition of bridges

Table II—Duties of Supervisory Officer in Charge of Bridge and Building Maintenance

	Number of roads	All bridge, building and water service work	All work except steel erection	All work but water service	All work but steel erection and water service	All work but water service and painting	All work except steel erection and painting	All work except supervision of pumping
Supervisor of Bridges and buildings	27	5	13	2	4	1	....	2
Master carpenter	10	2	5	1	1	....	1	....
Superintendent of bridges and buildings	4	2	1	....	1	....	....	....
General foreman	3	....	3	....	....	....	....	....
Bridge and building master	2	2*	....	....	....	....	....	....
Supervisor of structures	1	1	....	....	....	....	....	....

*On one road part of water service and painting of steel bridges is not handled by bridge and building master.

and buildings—in most cases, both—in a few instances, one or the other. Whether they handle all or only a part of the concrete work or the painting done, for example, on their territories, is of secondary consideration in this regard.

The terms "master carpenter" and "chief carpenter" are obviously heritages of the days when most bridges and buildings were built of wood and except in cases where the duties of the officer so designated are restricted largely to work on wooden structures these titles cannot be considered as characterizing the extent of the authority and responsibility of such officers. The name "superintendent of bridges and buildings," as applied to a division officer, has the objection that it may lead to confusion as was the deliberate intent of one officer with this title who had some stationery printed at his own initiative and expense, with the following heading:

Atlantic & Pacific Railroad
Chicago Division, Office of Bridge and Building Department
John Smith, Superintendent

In the case of a small road with but one bridge and building officer reporting directly to the chief operating or engineering officer, the term is probably the most appropriate one. The same comment applies in the case of a system field officer. But its use to designate a division or sub-division officer seems inappropriate.

As noted in the tables, a few roads apply the term "general foreman of bridges and buildings" to the division supervisory officer. In addition, certain others use this designation for men employed as assistants to the bridge and building supervisor. Clearly the term does not characterize the duties of the division officer to the same degree as that of "supervisor."

Most roads in Canada and a few in the United States use the term "bridge and building master."

While this term has the advantage of being expressive, its use constitutes a rather wide departure from general practice.

The title "supervisor," with an appropriate appendage, is probably the most expressive. It has the advantage of flexibility since the appendage may be made to indicate the scope of authority as, for example, "supervisor of bridges," "supervisor of buildings" or "supervisor of bridges and buildings." Or, if deemed desirable, it may be made to indicate responsibility for water service, as is done on the Ft. Worth & Denver City, by making it "supervisor of bridges, buildings and water service," a title that is all inclusive if perhaps rather cumbersome.

Uniformity in Titles Would Prove Advantageous

The fact that one road employs supervisors of bridges and buildings and another road has master carpenters is of no particular consequence insofar as it concerns the conduct of business on the individual road, for no matter what the title may be, the degree of authority of an officer is definitely understood on the part of all concerned. However, this variation in designations does result in unnecessary confusion in the relations of officers of this class on the various roads, as in the conduct of the business of associations or in the relations between the railroads and the public.

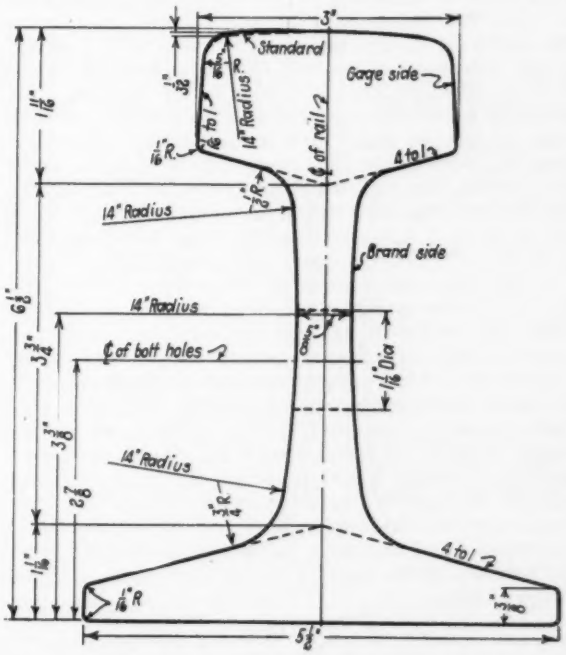
The shipper or the adjoining property owner has a well defined conception of the duties and responsibilities of the division superintendent because the term is one of universal application on the railroads of the United States and Canada. A similar uniformity of practice with regard to other positions involving public or inter-railway relations would also be of marked advantage and in view of the pronounced confusion that now prevails with respect to division bridge and building officers, a particular opportunity is afforded for improvement here.

Unsymmetrical Head Rail Section Produces Effects of Rail Canting

WITH the view of securing the benefit of canted rail, namely, the more uniform wearing of the rail head with its resultant increase in the life of the rail, which has commonly been attained by means of the canted tie plate or the adzing of the ties on an inclined plane, a modification of one of the standard rail sections has been developed and is being used on the Pittsburgh & Lake Erie, which in effect produces the desired cant without resorting to either of these methods. This is attained solely by the redesign of the standard rail head, which has been changed from a symmetrical section to one having a canted wearing surface. The particular section used on the Pittsburgh & Lake Erie is a slight variation of the 115-lb. Dudley section, which differs from the standard section only in the distribution of the metal in the rail head, the upper surface of the new head having a cant of about 1 in 75, by increasing the height of the rail on the outside 1-32 in. The center height and other dimensions of the new section have not been changed from those of the standard section.

The development of the canted or unsymmetrical rail head section on the P. & L. E. was the direct result of the effort on the part of that road to reduce the rapid wear of the head of the standard rail section on the gage side, and to distribute the wear more uniformly over the head without the necessity of installing canted tie plates or injuring the ties. The latter consideration was one of large importance on this road since, for the most part, it has in service hewn ties which were mechanically adzed and bored previous to their treatment. In all cases these ties were adzed in a horizontal plane and drilled with four holes on each end, two diagonal holes being for screw spikes used to secure the tie plates to the ties and the other two for cut spikes to hold the rail in place.

With the ties so adzed and bored, it was obvious that to secure the result desired by inclining the rails would throw the rail head inward and produce tight gage, if the same spike holes were used, and on the other hand would seriously injure the ties if the rails were spread at the base a sufficient amount to give proper gage, thus necessitating the redriving of both screw and cut spikes at points removed approximately one-half the diameter of the bit from



The Unsymmetrical Head Rail Section Is a Variation of the Standard 115-lb. Dudley Section

the original holes. To do this meant not only the mechanical destruction of the ties, but also greatly reducing the holding power of the spikes. As an alternative to secure the desired rail cant the unsymmetrical rail head was suggested and adopted. The first rail of this section was laid during 1925, in which year the P. & L. E. purchased 10,000 tons. The results obtained with this rail were so satisfactory that an additional 10,000 tons have been ordered for use in this year's rail program. The rails are all laid with the brand on the gage side so that the slope on the top of the head points down toward the gage side.

The unsymmetrical or canted head rail section was designed by the inspecting engineer's office of the New York Central Lines, in conjunction with A. R. Raymer, chief engineer, Pittsburgh & Lake Erie, who has had general supervision over this rail in service.

Welding Battered Joints Has Proved Economical

A Survey of the Extent to Which This Method Has Been Adopted Shows That It Is Regarded with Favor

Welding With a Special Tank Carrier

THE RECONDITIONING of rail in track by the building up of battered and chipped joints by the welding process has proved so successful, from the standpoints of both cost and service, that it is coming into extensive use on the railroads of America. As is well known, the principal cause for the removal of rail in important main line tracks, aside from the necessity of providing heavier sections to meet the demands of increased traffic, has been the battering of the ends of the rails, thus causing rough riding track on rail that is otherwise satisfactory. Before the introduction of welding the methods by which such rail has been made serviceable for use in main lines or important secondary lines has been either by sawing off the battered ends or re-rolling the rail, which processes involve several handlings of the material, transportation to and from the mills and loss of material from cropped ends, aside from the cost of the sawing or re-rolling itself.

With the rapid increase in the practice of building up rail by the welding process a résumé of what is being accomplished and the methods pursued on the large mileage of roads on which this method is in vogue will not fail to be of interest to all who have to do with the maintenance of track. To obtain this information, questionnaires were sent to 46 of the larger roads of the country with 187,700 miles of lines asking as to the extent to which the work is being carried on and the results obtained, together with such other available data, based on their experience, as would be of interest. Replies were received from all but two of the roads, the replies covering 176,000 miles of lines.

Early Work in Welding Joints

The application of welding to the building up of worn frogs and crossings on the steam roads dates back to 1913 when the Southern Pacific (Pacific System) repaired by this process two track crossings located in busy industrial tracks. Its advantages for this class of work were so obvious that in the next few years it came into extensive use. The application of the process to the building up of battered and chipped ends of rails in track appears to have been begun by the Central of Georgia in the latter part of January, 1917, and it was being used on that road when the railroads were placed under federal control. The resulting economies were so great that B. L. Winchell, director of the Southern region for the Railroad Administration, issued a circular in July, 1918, calling attention to the method and outlining its advantages, the circular arousing much interest in the subject and eliciting many requests for further information. During 1918 the Southern Pacific (Pacific System), faced with the labor shortage and high prices due to the war, extended the welding process to the repair of battered joints and in that year built up 5,000 joints in track, with such satisfactory results that at the present time each operating division has a gang of welders consisting of from 2 to 14 men engaged in this work.

During 1918, the Atchison, Topeka & Santa Fe and the Atlantic Coast Line inaugurated the practice and it was adopted by the Union Pacific in the following year. Other roads put the method into operation, after periods of experimentation, the greater number of them during the past four or five years, until today it is being used on roads with an aggregate road mileage of about 124,000 on which the records show that approximately 2,200,000 joints have been built up at an average cost of $1.48 per joint. These figures are admittedly incomplete since a number of the roads have not kept cumulative records of the joints repaired. In addition, the Boston & Maine, the Southern and the Wabash, with 13,000 miles report that they are now considering the matter. Still other roads with a mileage of 21,500 report that they have built up joints in the past but are not doing so now, while other roads with 17,700 miles report that they have done nothing in this respect. Roads with a mileage of approximately 13,000 have furnished either full or partial data with the request that their identity be not disclosed and their mileage and the number of joints treated have been included in the totals shown above.

No Injury to Rail Results from Welding

When this method was first introduced many doubts were expressed as to the safety of the process, there being a general fear that the heating necessary to make the welds would have an injurious effect upon the molecular structure of the rail. The same doubt as to the safety of welding has also been expressed when the gas welded bond was introduced in track circuits for signaling. The careful inspection of the behavior of the welded rails in service, supplemented by laboratory tests, has failed to support these fears when the work has been done properly and confined to that portion of the rail within the limits of the angle bars, this limitation being practically universal on the roads which are building up joints. This freedom from failure when the welding of joints is confined to the limits of the angle bars confirms the observations of the Committee on Rail of the American Railway Engineering Association which investigated and reported on the effects of gas welded bonds on rails in 1925, and which stated as its conclusion that "rail breakage appears to be confined to cases in which the bonds have been welded to the web or the base of the rail outside of the joint structure."

In the early use of the welding process some driver burns outside the ends of the angle bars were built up, and while there is no record of any failures on this account it appears to be the general conclusion

that it is not safe to do this, and the rails so built up have been replaced as a matter of precaution and the practice discontinued. Another practice which has been discontinued is that of burning bolt holes through the web of the rail to avoid drilling, since rail end failures have been traced directly to rails where this had been done and investigations have showed that incipient cracks were present around the burned holes. As an explanation of this condition the theory seems sound that the expansion and contraction in the metal surrounding the hole set up stresses which cause the cracks, while the ends of the rails, being free to expand and contract without restraint, were free from such stresses.

All of the roads reporting state that they have found no evidence of injury to the rail from welding when proper precautions are followed. The Union Pacific states there have been no rail failures due to welding since 1921, when a special welding steel was adopted. The Minneapolis, St. Paul & Sault Ste. Marie insists that the flame of the torch be kept from direct contact with the angle bars. The Atchison, Topeka & Santa Fe confines welding to within 12 in. of the rail end, while the Central of Georgia states that it has found no evidence of injury to rails from welding and has taken no special precautions against such a condition. The Chicago, Burlington & Quincy, in order to satisfy itself as to the influence of welding on rail end failures, has issued instructions that in the event of a rail end failure or bolt hole break the failed rail report must show whether or not the rail end had been welded and during the period of a year since these instructions were issued no such breaks have been reported on welded rails.

The Processes Used

The welding may be done either by the oxy-acetylene torch or the electric arc. All but two of the roads engaged in building up joints use only the oxy-acetylene process. The only exceptions reported are the Southern Pacific (Pacific System) which, in addition to numerous oxy-acetylene outfits has two semi-portable electric outfits which are used primarily for building up joints on track in paved streets and it now has under construction two modern electric machines, mounted on flanged wheels, and capable of traveling to remote sections of its lines. The Western Pacific, which has used both the oxy-acetylene and the electric process, is now using the latter exclusively.

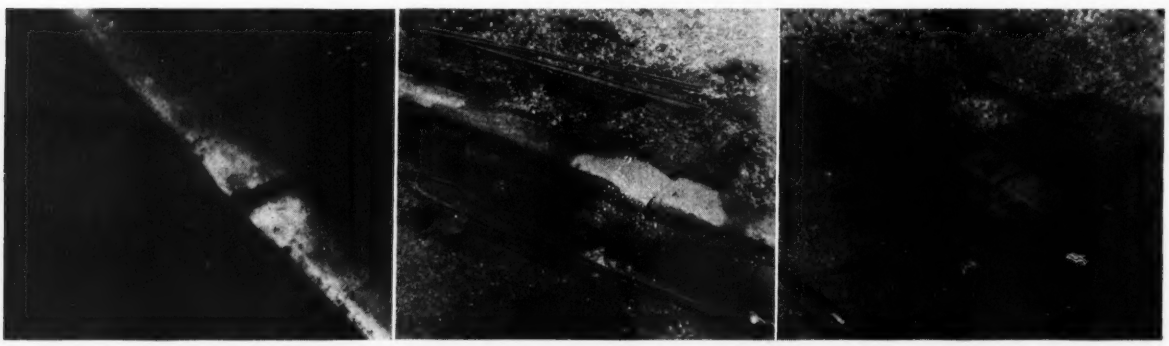
As may be expected the cost of welding ranges

Data From Various Roads on Welding Battered Joints

Name of Road	Mileage	Are Joints Welded?	How Many Years?	Method Used	No. Joints Welded	How Are Joints Selected?	In Work Shop or Face	Minimum of Batter Welded	Organization: Gang (Welder) (Helper)	Organization: System of Division	Organization: No. of Gangs	Results of Work	Increase in Life of Rail	Any Evidence of Injury to Rail	Cost Per Joint Welding Labor and Material	Remarks
A.T.& S.F.	12,043	Yes	8	Oxy-Acet.	120,000 in 1925	Inspection	Yes	1/16"	2-w,1-h		40	Very Satisfactory	25% in First Position	No	$1.26	Gangs are assigned to each asst. gen. supr. territory
A.C.L.	4,931	Yes	9	Oxy-Acet.	No Record	Chipped Ends	No		1-w,4-h	Div	3	Generally Satisfactory	Undetermined	No	40 to 80 cts.	
B.& O.	5,197	Yes	1	Oxy-Acet.	3,000	Inspection	No	1/16"	1-w,1-h	Div.	8	Welds have stood up	Undetermined	No	1.00 to 1.50	
B.& A.	404	No														
B.& M.	2,848	No														Considering the subject
B.R.& P.	606	Yes	2	Oxy-Acet.	2,000	Inspection	No		1-w,1-h	Sys.	4.	Welds Stand Up	Undetermined	No	1.42	Temp joints replace worn anglebars and tighten bolts before welding
Can.of Ga.	1,921	Yes	9	Oxy-Acet.	11,800	Inspection	No		1-w,1-h	Div	5	Weld Failures less than 5%	Undetermined	No	1.75	Welding gang also replaces frog bolts,etc.
C.R.R.of N.J.	691	No														
C.& A.	1,058	Yes	1	Oxy-Acet.	6,400	Inspection	Yes	1/16" to 1/8"	2-w,1-h	Div	3	Satisfactory	3 to 5 Yrs expected	No	1.30	Welding is confined to rail 3 Yrs. or more in track
C.& E.I.	948	Yes	4	Oxy-Acet.	20,000		Both		1-w,1-h	Sub-Div	6	Very Satisfactory	About 3 Yrs	No		Select trackmen, usually foremen for welders. Gangs replace frog bolts, etc.
C.& N.W.	8,487	Not Now	5	Oxy-Acet.	30,000	Inspection	Both			Sub-Div	None Now	Not Determined	Not Determined	Not Yet	2.00	Question economy of welding
C.B.& Q.	9,406	Yes	5	Oxy-Acet.	98,000	Inspection	Yes	1/16" or chipped	4-w,1-h	Sys	7	Generally Satisfactory	4 Yrs.	No	1.25	Renew worn anglebars and examine rail for defects when bars are changed
C.G.W.	1,498	Yes	3	Oxy-Acet.	2,500	Inspection	Not as a rule			Div.	1	Very few cold failures	About 3 Yrs.	No	2.08	
C.M.& St.P.	10,784	Not Now		Oxy-Acet.	4 or 5 Mi.		Yes				None Now	None		No		Have not been able to develop any saving by welding
C.R.I. & P.	7,564	Yes	2	Oxy-Acet.	6,000	Inspection	No	1/16"	1-w,1-h	Div.		No weld failures	Not determined	No	0.75 to 1.25	
(Western Road)	2,000	Yes	5	Oxy-Acet.	70,000		No			Div.	2	Good	About 6 Yrs.	No	$2.00	
C.& S.	1,057	Yes		Oxy-Acet.												Just starting work. Have no data to furnish
D.& H.	995	Yes	4	Oxy-Acet.	700	Inspection	No	1/8"	1-w,1-h	Div.	4	Very Good	Possibly 30%	No	1.80	Welding gangs work mostly on frogs and switches
D.L.& W.	995	No														
D.& R.G.W.	2,577	Not Now		Oxy-Acet.	6,000	Inspection	No		1-w,2-h	Sys.	2	Good	Approx.2 Yrs	No	1.56	Work done in 1924
Erie (New York Region)	1,290	Yes	2	Oxy-Acet.	No Record	Inspection	No	3/16"		Div.		Good	No data	No	0.90 to 2.00	
Erie (Ohio Region)	677	Yes	3	Oxy-Acet.	15,000	Inspection	Partly		1-w,1-h	Sub-Div		Less than 1% Weld Failures	2 Yrs.Main Line	No	1.89 to 2.04	Worn anglebars are changed before welding
G.T.W.	992	Yes	2	Oxy-Acet.	2,500	Inspection	Yes			Sys.	1	Good	Possibly	No	1.70	
G.N.	8,222	Yes	5	Oxy-Acet.	210,000	Inspection	No	1/16"	2-w,1-h	Div.	21	Satisfactory	5 Yrs. 2 to 5 Yrs.	No	1.75	Joints are tamped a few days in advance of welding
I.C.	6,807	Yes	6	Oxy-Acet.	128,000	Inspection	No			Div.	12	Satisfactory	2 to 3 Yrs.	No		Temp joint and change worn anglebars before welding. Change rail where cost of welding exceeds $2.50 per joint
L.V.	1,364	Yes	4	Oxy-Acet.	500	Chipped Ends	No			Div.	Varies	Very Good	Undetermined	No	2.00	Have found it necessary to weld only a few rails
Long Island	397	No														
L.& N.	5,008	No														
M.C.	1,662	No														
M.St.P.& S.S.M	4,404	Yes	4	Oxy-Acet.	16,000	Inspection	No	1/16"		Sys.	3	O.K.	30%	No	2.08	Rail laid prior to 1913 not welded
M-K-T	3,188	Yes	4	Oxy-Acet.	15,000	Inspection	No	1/32"	1-w,1-h		5	Satisfactory	3 to 4 Yrs.	No	1.10 to 1.60	
N.C.& St.L.	1,260	Yes	9 Mo.	Oxy-Acet.	2,938 to April	Judgment of Welder	No	3/64"	1-w,1-h	Div.	3	Satisfactory in most cases	Not Determined	No		Weld failures that have occurred have been on very soft rail
N.Y.C.	8,710	No														
N.P.	6,649	Yes	2	Oxy-Acet.	700	Inspection	1		1-w,1-h Appr.	Div.		No apparent failures	No data	No	1.00 to 1.50	Very little work has been done on rail
(Western Road)	3,300	Yes	3	Oxy-Acet.	25,000	Inspection	No	1/8"		Div.	6	Practically no failures	Not determined	No	1.98	Saves maintenance cost and provides better riding qualities
P.M.	2,265	Not Now		Oxy-Acet.	2,000							Fairly good			2.36	Experimented in 1923 and 1925
St.L-S.F.	4,902	Yes		Oxy-Acet.	6,977											
St.L.S.W.	1,777	No										Very Satisfactory to date	No data	No	1.15	Doing little at present. Work was done in 1923 and 1924
S.A.L.	3,929	Yes		Oxy-Acet.												Have done too little to furnish data
Southern	8,111	No														Have experimented and are considering
S.P.(Pac.Sys.)	9,758	Yes	8	Oxy-Acet. and Elec.	289,585	Inspection				Div.		Very Satisfactory	3 Yrs.	No	1.80	Using oxy-acetylene now principally but building some electric machines
S.P.(La.& Tex.	4,810	Yes	8	Oxy-Acet.	6,500	Inspection	No		1-w,1-h		3	Satisfactory	No Data	No	1.00	Gangs work principally on frogs and switches,worn joints are replaced before welding
U.P.S.R.	3,891	Yes	7	Oxy-Acet.	226,436	Inspection	Yes	1/16"	(1-w,1-h) (6-w,2-h)			Less than 2% Weld Failures	2 to 4 Yrs.	No	1.00 to 1.80	Joints are tamped and worn anglebars replaced before welding
U.P.System					(966,553)											
Wabash	2,822	No														Considering the subject
W.P.	1,042	Yes	3	Oxy-Acet. and Elec.	20,795	Inspection	No	1/16"				No Weld Failures	No Data	No	1.56	All welding now being done by electricity

between rather wide limits from a minimum of about $1 per joint to a maximum of $2.88 in some exceptional cases, although the tendency is now to change out the rails when the cost of building up the joints will amount to $2.50 or more. The amount of work done, as well as the organization of the forces naturally has an influence on the cost and on the roads which are doing the work on an extensive scale the range is between $1 and $1.75, with a weighted average for these roads of $1.38. On the Southern Pacific the cost for welds 6 ins. long averages $1.20.

The Atchison Topeka & Santa Fe built up 120,000 joints in 1925 at an average cost of $1.26. The cost on the Union Pacific, where a total of 226,435 joints were built up from 1921 to 1925, inclusive, has ranged between $1.00 and $1.20, while the average cost on the Illinois Central is $1.33, on the Great Northern $1.75 and on the Chicago, Burlington & Quincy $1.25. The Chicago, Rock Island & Pacific, which does a large amount of welding on frogs and crossings but which has not gone extensively into the practice of welding rail, reports that its costs for welding rail ends ranges between $0.75 and $1.25 ordinarily with an average of about $1, but that in exceptional cases the costs have run as high as $2.88 per joint. It states that the cost of welding in the winter is higher than that done in the summer and this statement is corroborated by the Union Pacific, the reason being that more oxygen and acetylene are required to bring the rail to fusing heat in cold weather, although the quality of the welding done in the winter is equal to that done during other seasons.



Joint Before Welding | Joint Fused for Welding | The Finished Weld

Results Obtained by Welding

All of the roads engaged in welding joints report that the results are satisfactory, both in the improvement in the riding qualities of the track and in the lengthening of the life of the rail. Few failures of welds are reported where the method has been in use for some time, most of the failures occurring when the practice was being inaugurated, due usually to inexperience. The Central of Georgia reports that the failures of welds have not been over five per cent and the Union Pacific reports less than five per cent of failures. The Nashville Chattanooga & St. Louis whose chief engineer, Hunter MacDonald, has made exhaustive studies on the battering of rail joints, reports that the building up of such joints by welding was inaugurated on that road in January of the present year since which time a total of 2,858 joints have been welded with satisfactory results in most cases, and the weld failures that have occurred were chiefly on very soft rail. The Chicago Burlington & Quincy, which welded 95,000 joints from 1922 to 1925, inclusive, and whose program for 1926 covers 75,000 joints, reports that the results have been satisfactory.

The increase in the life of rail on which welding has been done varies, of course, with traffic conditions but on the roads where the practice is in extensive use a marked increase in life has been noted. The Atchison, Topeka & Santa Fe reports that the life of the rail is increased by about 25 per cent while the Minneapolis, St. Paul & Sault Ste. Marie reports 30 per cent. A western road which has welded 70,000 joints reports an increase in the life of the rail of five years, due to welding; the St. Louis-San Francisco reports four to six years, the Chicago, Burlington & Quincy an average of four years; the Missouri-Kansas-Texas three to four years, the Delaware & Hudson possibly four years, the Southern Pacific (Pacific System), the Illinois Central, the Chicago & Eastern Illinois, and the Chicago Great Western, three years; the Great Northern, two to five years and the Union Pacific, two to four years. Other roads furnished no data as to this or have been welding too short a time to determine the increase in the life of the rail. The Baltimore & Ohio, which has been welding only a year, reports that while it cannot determine the increase in the life of the rail, the higher standard of joint maintenance is very noticeable.

Organization for the Work

The organization for the work usually contemplates one or more welding gangs consisting of one or two welders and an apprentice or laborer, or some multiple of this crew. It was formerly the practice to assign one apprentice or helper to each welder, but in most cases it has been found that one helper is sufficient to serve two welders, with a consequent reduction in cost. The welders and helpers are preferably selected from men who have had experience in general track work and on some roads, notably the Central of Georgia and the Chicago and Eastern Illinois, the welding gangs replace worn frog bolts and do similar work in addition to their welding, the latter road selecting track men, usually foremen, for this work. On roads where the building up of rail joints is carried on as the primary purpose of the gangs, they also build up frogs and crossings as they come to them. Other roads, such as the Delaware & Hudson, the Lehigh Valley and the Northern Pacific maintain welding gangs primarily for frog and crossing work and use them incidentally to build up the rail joints, the Atlantic Coast Line and the Lehigh Valley confining their welding to rails with chipped ends.

When the gangs are working principally on frogs

and crossings in track, they are furnished with motor cars for transporting themselves and the gas tanks over the road, and with outfit cars for living quarters when on the road. When their work also includes considerable work on rail joints they are usually provided also with specially designed dollies or buggies for moving the gas tanks from joint to joint. One such carrier is designed like a hand truck so that it can be used for trucking the tanks on ordinarily even surfaces, and is supplied with an extra pair of double flanged wheels set transversely on the body to allow them to rest on one rail of the track, a hinged outrigger with a roller on its end resting on the other track rail. This arrangement permits the gas tanks to be moved easily along the track and permits the ready removal of the device when necessary to clear trains.

Practice varies as to the assignment of gangs, some roads assigning them regularly to certain operating divisions, while others move them from division to division as their services are needed. Some roads, especially those in northern regions, among which may be mentioned the Union Pacific and the Minneapolis, St. Paul & Sault Ste. Marie, work the gangs on the track during the open seasons and in the winter assign to them the work of building up frogs and crossings which have been removed from track on account of wear, thus putting them in condition for further service. On a number of roads preliminary work preparatory to welding is done in the way of tamping up the joint ties, adjusting expansion, applying anti-creepers where needed, and replacing worn angle bars. Among the roads following this practice are the Chicago Burlington & Quincy, the Erie, the Great Northern, the Illinois Central, the Southern Pacific, the Union Pacific, and the Buffalo Rochester & Pittsburgh. E. F. Robinson, chief engineer of the latter road states that it is their opinion that the work of reconditioning rail ends by welding is an unwarranted and useless expense unless the joints are first put in good condition, including replacing muddy ballast under the joints with clean ballast, surfacing and retamping the joints, renewing bent, worn or cracked angle bars or joints and tightening bolts.

A Battered Joint Before Welding — The Same Joint After Welding

Most roads which are welding use 1/16 in. as the minimum amount of batter to be welded and perform the work out of face, at least to the extent of building up in any particular stretch of rail all joints with chipped ends or which have more than the predetermined amount of batter in any given stretch of rail. However this practice is not universal for the Central of Georgia reports that it does spot welding almost exclusively and that the number of joints to be welded does not ordinarily run over 25 or 30 to the mile while the Minneapolis, St. Paul & Sault Ste. Marie states that it is shaping its work along lines which will provide for building up all battered joints out of face and dispense with the necessity of covering the same territory so often.

In selecting the joints to be built up it is the common practice to do this by an inspection carried on by the division engineer, roadmaster or supervisor, using a straight edge and taper gage to measure the amount of batter. On the Central of Georgia and the Chicago Burlington & Quincy the length of the weld is marked for the guidance of the welder at the time the inspection is made.

Welding Gang Working on Main Line Rail

Work on Specific Roads

Illustrative of the methods pursued on the roads which have gone into this matter on an extensive scale may be cited the organization on the Southern Pacific where 103,539 joints were built up in 1925, and where the total number of joints welded amounted to 329,583 to the end of April of the present year. On this road each operating division has a gang of welders consisting of from 2 to 14 men under the general supervision of a superintendent of welding. Where the gang contains more than one welder, a lead welder is designated to take charge of the outfit. The joints to be built up are selected by the welder who has been instructed by the division engineer and the roadmaster as to the location of the work. Where weldings is to be done the track is worked over by the section forces who close up the expansion, tamp the joint ties, renew worn angle-bars and apply anti-creepers in advance of the welding operations. In determining the joints to be built up a straight edge is laid longitudinally on the rails across the joint and all joints showing a deflection from the plane of the tops of the rails are built up. A number of welds have been in service six years and it is estimated that the life of the rail in its first cycle of use is increased about three years.

The Atchison, Topeka & Santa Fe built up 120,000 joints in 1925. On this road welding gangs, usually consisting of two welders and a helper, are assigned to each assistant general manager's territory, there being a total of 40 gangs on the system at the present time. When any stretch of track shows battered rail ends a gang is placed on it, working over it out of face and building up all joints showing a depression of more than 1/16 in. A recent investigation showed that the joints built up are proving very satisfactory and it is estimated that the life of the rail in its first position is increased 25 per cent.

On the Union Pacific proper 226,436 joints were built up from 1921 to 1925, inclusive, there being

no record available of the number built up prior to 1921. On this road the division engineer selects the joints to be welded, which are restored to the exact line of the plane of the tops of the adjacent rails, all joints showing batter of 1/16 in. or more being built up.

In unsettled country it is found practical to assign four to six welders, with two to three helpers to a gang, furnishing them with camp cars for living quarters. In settled country, with greater traffic density, one welder and one helper usually constitute a gang, which is furnished with a camp car. The welding gangs are a part of the division force and are under the general supervision of the general roadmaster who directs their movements from one roadmaster's district to another, the gangs being under the direct supervision of the roadmaster of the district on which they are working. Over 95 per cent of the welds have stood up under traffic and there has been no injury to the rail since the adoption of a special welding steel in 1921. It is expected to increase the life of the rail from two to four years by this method.

The Great Northern began building up rails in 1921, and to date has welded 210,000 joints and in addition has repaired 15,000 frogs and approximately 5,000 switches in track by this method. A welding gang of two welders and one helper is assigned to each division, and a total of 21 gangs are now used. The work to be done is determined upon after special inspection and is confined to joints with a batter of 1/16 in. or more and to those with chipped ends. The results as a whole have been satisfactory although there were a few partial failures of the welds when the work was started. The life of the rail is increased from two to five years.

The Chicago, Burlington & Quincy began welding experimentally in 1922, when 1,500 joints were built up, and continued the work in 1923, when 3,500 joints were welded. The experiments proving successful, the work was put into regular operation in 1924, 30,000 joints being built up in that year and 60,000 in 1925, while the program for 1926 contemplates the welding of 75,000 joints. On this road the standard gang consists of a head welder, three welders and two helpers, although at times five welders and three helpers are used in a gang. Seven gangs are employed in this work and are moved over the system as needed, remaining on a division only long enough to do the work authorized and working under the supervision of the roadmaster, the district engineer having general supervision of the gangs while they are on his district.

When the rail in a stretch of track begins to show noticeable batter or chipped ends an inspection is made by the district engineer, accompanied by the division superintendent and the roadmaster. As a general rule welding is not decided on unless 50 per cent of the joints show approximately 1/16 in. batter or are chipped. The general condition of the rail, the amount of traffic and other pertinent factors are taken into account, a separate study being made of each stretch of track inspected. No evidence has been found of any injury to the rail due to welding and, as has been said, this subject has had special attention during the past year. With the exception of some few failures in the early stages of the work the welds have stood up satisfactorily under traffic and the life of the rail has been increased about four years.

The Illinois Central started building up joints by welding in 1921, and has continued the practice every year since that time with satisfactory results, 125,000 joints having been welded during that period. The joints are selected by the track supervisor with the rule that where the cost of building up a joint will exceed $2.50 the rail is to be changed out instead. The joints are tamped and worn angle bars are replaced in advance of the welding. This road now has 12 outfits operating on divisions, each welder building up about 10 joints per day. No injury to the rail has been found and the life of the rail is increased from two to three years.

Not All Roads Have Continued Welding

Some roads which have done welding with good results are not doing the work except in special cases but anticipate that they may find it desirable to do so later on. Thus the Northern Pacific, which maintains a welding outfit consisting of a welder, apprentice and helper on each division, has only built up 700 rail joints, of which 640 were on a branch line relaid with rail having battered joints, where the work was done to improve the riding qualities. This road states that a large proportion of its main line rail is 90 lb., which for various reasons it is not desired to maintain in the main line beyond its normal life, since the demand for good relay rail for branch lines and new construction often necessitates the removal of this rail from main lines before it would be released otherwise. When the 100 lb. and 130 lb. rail, which is now being laid in main track, develops battered joints it is thought likely that the practice of building up the joints will be adopted. Similarly, the Chicago, Rock Island & Pacific feels that while there is merit in building up battered rail ends in certain places and under certain conditions, such as where the weight of rail in the track is the same as it is proposed to maintain there and where the expense is warranted in securing as great a life as possible out of the rail before it is renewed. On the other hand it believes there is no economy in attempting to prolong the life in the first cycle of service of rail of lighter section than it is expected to maintain in the track, other than to build up occasional battered joints.

The Chicago, Milwaukee & St. Paul has done some experimental work during the past three or four years, building up the joints on four or five miles of track by the oxy-acetylene process, but states that it has not been able to develop sufficient savings by welding rail to justify the expense. It has two system outfits welding crossings and frogs. On this road when the rails and fishing surfaces are worn and the receiving rails are pounded down but not badly battered it is the practice to renew the joint bars and at the same time to adjust the expansion and gage the track. The Pere Marquette also experimented with welding on its Detroit division in the fall of 1922 and the spring of 1923, building up 2,008 joints at an average cost of $2.35 per joint, but has done no welding since that time.

The Chicago & North Western has built up isolated joints for five years and carried on more extensive operations for two years, a total of 30,000 joints having been welded at an average cost of about $2. It is not now doing any of this work extensively as it is not satisfied that the life of the rail is increased sufficiently to justify the expense of building up all joints out of face, rather than confining operations to exceptional joints or those battered 1/16 in. or more. The Denver & Rio Grande Western reports good results from 6,000 joints built up in 1924, at an average cost of $1.56, but has not continued the work.

Spray Painting Proves Effective In Maintenance Department

New York, New Haven & Hartford Operates Fourteen Units Throughout Entire Year with Good Results and Marked Economy

CONFRONTED with a large volume of interior and exterior maintenance painting, which formerly involved the constant employment of a large force of painters, the New York, New Haven & Hartford has gone into the use of paint spraying equipment extensively. Beginning with a single unit which was first put in operation during 1923, the equipment of the New Haven now consists of 12 gasoline-driven paint spraying units and 2 electrically-driven units, all of which are of the portable type and adaptable for a wide variety of painting.

As was expected, this equipment was not introduced on the New Haven without encountering difficulties, although the great majority of these were due to the inexperience of the men in charge of the equipment. This, in many cases, led to spotty painting, coats too thick or too thin, and other evidences of poor painting work. After several months, however, two men had become quite expert in the use of the spray guns and these men were then used to instruct new men in the use of the equipment. Having passed the experimental stage in this respect, the New Haven has added to its equipment until it now has 14 trained spray painting crews working over the system. For the most part one paint gang and unit are assigned to each of the 10 divisions, with four additional outfits for use where the work is most urgent or the heaviest.

With this equipment it has been found that the painting of large flat areas can be done most economically, although experience has demonstrated that a large variety of painting work can be accomplished more economically with the paint spray than with the brush, which fact has led to the widespread use of this equipment for both bridge and building work.

Programming Provides for Uniform Forces

Early in the year the New Haven prepares a complete program of its painting work for the entire year. This is made up in the office of the engineer of maintenance of way and is based to a large extent on the recommendations of the divisions. In so planning the work for the year, an attempt is made to line up the activities of the paint spraying and brush painting gangs so that the structures most urgently in need of attention will be painted first and so that there will be no delay in the progress of the work. The programming of the painting work provides also for the consistent movement of the equipment over the various divisions and permits the systematic ordering of painting materials which insures their being on hand when needed. With such a program the painting work proceeds smoothly under the direct supervision of the division bridge and building supervisors.

As was the practice when brush painting was standard on the New Haven, the spray painting gangs are maintained intact throughout the year, for the most part doing outside painting during the summer and inside work during the winter months. Beginning about the first of April, when the weather is favorable, outside work begins. This consists largely of painting station buildings, train sheds, bridges, board fences and such other structures as present a substantial surface. All of this type of work is facilitated by the use of the paint spraying equipment and involves little work in protecting adjacent surfaces not to be painted, or to receive a different color from that being used. During the winter painting season, which in the territory of the of the New Haven begins late in October, interior work is undertaken such as painting the walls and trim of passenger stations and office and shop buildings.

Interior Painting with the Spray Gun

The success in doing this class of work with a paint spray is particularly well demonstrated in the general office building of the New Haven at New Haven, Conn., where the entire interior was refinished satisfactorily without presenting difficulties other than the careful covering of the floors and woodwork while the walls were being painted. This was overcome by the use of canvas covers and long metal shields which were used to protect the woodwork while the walls were being painted and the walls while the woodwork was being varnished. The paint used in this work was mill white, to which a pigment was added to give a light green color. One coat of this material, as applied by the spray guns, gave a satisfactory finish, while the walls were in such condition that it was obvious that two coats would have had to have been applied by the brush method. The particular features of this work, which was done early in 1925, were not alone the high grade of work accomplished and the saving in material, but also the fact that each office was painted in so short a time that minimum interference was experienced by the occupants in the carrying out of the regular office work.

One of the latest types of surfaces to be painted on the New Haven, and one which is being covered with excellent results and at a considerable saving, is the concrete walls of subway entrances to one of its principal passenger stations. In this work the surface of the concrete is covered thoroughly with a sizing to close all of the pores of the concrete, and then, with the same equipment, two coats of white enamel give a light-reflecting surface which enhances the appearance of the subway and which is easily kept clean.

Ready Mixed Paint Is Used

While some of the paint used in the work is made up on the job, the greater part of it is purchased ready mixed, it having been found possible to secure economically many grades of paints, stains and varnishes suitable for use with the paint gun. On the recommendation of the maintenance of way department, the purchasing department keeps in stock an ample supply of standard color paints and such

special painting materials as will be required. These paints and materials are then issued to the various division paint gangs on monthly requisitions.

With more painting work capable of being spray painted satisfactorily, than can be handled by its present equipment, it has not yet been found practical on the New Haven to spray-paint small broken surfaces such as bridge lattice work, fire escapes, fencing, some building trim, etc., which is still brush painted by separate forces. This is due primarily to the impossibility of confining the paint from the spray gun to the surface to be covered, which in some instances involves a large loss of material. On large bridge work it has also been found impractical to use the paint spraying equipment since it is very difficult for the operator of the gun to work effectively unless he has a firm footing and both hands free to manipulate the gun and support the paint hose. Where scaffolding can be provided readily this difficulty is largely overcome and in some instances more thorough work is accomplished through the ability to spray-paint many surfaces and joints which are only reached by the brush with great difficulty. Another instance of the difficulty encountered in bridge painting with the paint gun has been the inside faces of deep, adjacent plate girders, particularly on some of the New Haven's larger exposed river bridges where strong air currents carry the paint spray away from the surface. While in any outside painting it has been found difficult to use the paint spray economically in a strong wind, this is particularly true when the air currents are at right angles to the flow of paint from the gun.

Both Gasoline and Electric Units Are Used

The paint spray equipment used on the New Haven consists of a combination power unit, compressor and air tank mounted on a three-wheel carriage, two portable eight-gallon paint tanks mounted on two-wheel trucks, two paint spray guns and sufficient rubber hose to permit the moving of the guns over a large area without the necessity of moving the power unit or the paint tanks. For the most part the work of the gasoline units is confined to outside work or large interiors, while the motor-driven units have been used satisfactorily for this kind of work as well as for any class of interior work where the ordinary lighting circuit is available to furnish current for the machines.

The paint tanks, hose and guns supplied with each outfit are used successively for each type of paint or color of paint applied, it being necessary only to clean the equipment thoroughly, which can be done readily with the use of about one gallon of turpentine. The maintenance of the equipment is in charge of the system superintendent of work equipment who makes all minor repairs. If heavier repairs become necessary the equipment is turned over to the mechanical department.

Details of Operation

In actual operation the power unit of the paint spraying outfit develops a pressure of about 80 lb. in the air chamber and forces the paint from the paint gun which is normally held about 12 in. from and at right angles to the surface to be painted. Owing to the fine paint spray from the gun, a portion of which does not adhere to the surface being painted, the atmosphere about the operator often becomes quite "rich," especially on interior work, an objection which is overcome by the use of a special mask by the operator which filters out of the fine paint particles, or by the use of a nose and mouth guard which serves much the same purpose.

The gang for each painting outfit usually consists of three men and a working foreman, at least two of the men being expert in the use of the spray guns. The other men prepare, attend and move the equipment and assist in cleaning the surfaces to be painted as well as in moving ladders and scaffolding. Where any large amount of preliminary work is necessary, the paint gang is preceded by men who prepare the surface, doing such washing, burning, scraping and spot painting as is necessary, it having been found most economical to do this and keep the paint spraying equipment in constant operation.

With this type of equipment and organization, now that the men have become proficient, excellent work results as a rule and there are no evidences of spotty painting or surplus paint, or any tendency of the paint to crack and blister. From records kept it is estimated that a saving of approximately 50 per cent is effected in labor, while the work is also expedited materially. It is estimated that the paint consumption runs approximately 10 to 15 per cent more per coat, although this increased use of material is more than offset by the fact that whereas two brush coats were formerly required in most work to give a satisfactory finish, this, in the majority of cases, is now accomplished with one coat applied by the spray method.

Maintenance Motor Trucks Move Equipment

While the portability of the equipment makes the moving of it on a job a simple matter, the New Haven makes use of its maintenance department motor trucks to move the equipment over considerable distances or from job to job. These trucks, one or more of which are maintained at each of the principal terminals, are standard one-ton Ford trucks. They are usually operated within a radius of about 20 miles to carry men and materials of the bridge and building, water service and track departments to any special work where the use of the truck will facilitate the move. The trucks are also used to some extent by the other departments to move materials and equipment about terminals, and in special instances by signalmen and linemen.

When used by the paint gangs, the painting outfit is lifted on the truck and moved to the building or other structure to be painted. When a structure is not accessible by road, as is the case at many river bridges, the complete painting outfit is moved on a local freight and set off at the point desired. While these methods of moving the painting equipment have proved satisfactory at or near terminals, and at special locations on the line not accessible by road, the problem of moving the outfit from place to place between stations and at stations has given rise to the consideration of establishing camp car outfits, each of which will be equipped with a light motor truck, the motor truck being recommended over the use of track motor cars owing to the density of high speed traffic on the majority of the lines of the New Haven. With this equipment, it is anticipated that a paint gang can start out each morning with a day's supply of paint and go from place to place until all of the painting work has been done for a distance of about five miles each side of the camp.

SWITCH WRECKS TRAIN.—Six persons were killed on August 13 when a fast passenger train of the Long Island Railroad was derailed by a defective or unfastened switch at Calverton, N. Y.

What It Requires to Maintain an Important Railroad*

An Analysis of the Expenditures, a Summary of the Employees and a Statement of the Equipment Used

By J. V. NEUBERT
Engineer Maintenance of Way, New York Central, New York City

THE maintenance of way department on the lines east of Buffalo is headed by an engineer of maintenance of way who reports direct to the general manager. He has under his supervision a staff consisting of an engineer of track, an engineer of bridges, a general supervisor of buildings, a mechanical engineer, an office engineer, a general scale inspector, a general treating inspector who supervises the seasoning and treating of lumber, and a designing engineer, all of whom have assistants and inspectors to aid them in their work, and clerical forces for compiling statistics, reports, and so on.

This territory is divided into 11 divisions. On one, the Electric division, the division engineer reports to and receives instructions from the division superintendent. On the other 10 divisions the division engineers report direct to the engineer of maintenance of way. Each division engineer has his own organization, consisting of a clerical and engineering force, a supervisor of bridges and buildings, and supervisors of track, with assistants and inspectors, and they in turn have foremen, assistant foremen, mechanics of all classes, and laborers. These forces conduct the general maintenance work of the property and, in addition to this, perform work for other departments, as well as doing one-third of the new construction. The total work performed by this department amounts to $24,000,000 to $26,000,000 a year.

The weighted average percentage of employees in the department is:

	Per Cent
Supervisors	4
Bridge, building and track foremen	11
Carpenters, mechanics, etc	15
Laborers	65
Miscellaneous	5
Total	100

*From an address delivered before the New York Central Athletic Association at Rochester, N. Y.

The average operating expenses for the last 15 years, or the operating ratio, was made up as follows:

	Per Cent
General expenses	2.4
Traffic	1.4
Transportation	37.6
Motive power and rolling stock	20.7
Maintenance of way and structures	11.9
Miscellaneous	1.4
Total	75.4

This means that we spend for maintenance of way and structures, 11.9 cents of every dollar earned. Maintenance of way expenses are divided as follows:

	Per Cent
Supervision	3.9
Ballast	3.0
Ties	17.2
Rail	7.6
Other track material, such as splice bars, frogs, switches, switchstands, tie plates, bolts and spikes	7.3
Track labor, including roadway labor	37.4
Removing snow, ice, etc	4.0
Bridges, trestles and culverts	4.6
Buildings, fixtures and grounds	9.8
Roadway tools and supplies	1.2
Docks and wharves	1.1
Miscellaneous	2.9
Total	100

The average proportion of labor and material for all these charges is: labor, 56 per cent; material, 44 per cent.

These proportions for the last eight years varied as follows:

Year	Labor Per Cent	Material Per Cent
1917	63	37
1918	68	32
1919	61	39
1920	68	32
1921	49	51
1922	56	44
1923	59	41
1924	58	42

You will note, particularly through the war period, that there was very little control of labor or material, but in the last two if not three years, we are beginning to approach normal.

The average number of man-hours applied per annum for all classes of work for maintenance, per mile of track, is as follows:

Year	Man-Hours Per Month
1915	282
1916	290
1917	290
1918	250
1919	245
1920	260
1921	190
1922	225
1923	290
1924	240

The weighted average man-hours prior to 1915 were as much as, if not more than for the years 1915, 1916, 1917 and 1923. I feel that, with improved appliances and mechanical devices, our man-hours will not be greater than for the pre-war period. However, the proportion of cost on account of war conditions will be, in my estimation, 40 per cent or possibly 60 per cent greater than the pre-war normal.

Our tie cost is one of the largest material charges, as 17 per cent of both labor and material money is spent for this account. On account of forest conditions and the increased price of ties, the company at one time felt that it would be forced to use ties of some other material, but it seems that, for the present, treating the ties, particularly with creosote, has solved the problem. The woods we treat for cross ties are sap yellow pine, red oak, beech, birch, maple, gum and several other kinds of wood which have practically no life without seasoning and treatment with creosote oil. Ties retain from 2 to 3½ gal. of oil per tie, depending on the kind, character and size.

In 1910, when we started to treat ties, their average life was 11.4 years; according to our renewals for 1925 and 1926, this has been increased to 18 or 19 years. This represents a saving of 37 per cent, or approximately 750,000 ties per year. At this time approximately 58 per cent of the ties in track have been treated. As we approach 100 per cent treated ties, I believe that we shall easily get an average life of 20 years, if not more.

The history of tie plates dates back to about 1853. In those times they were called "rail shims." They were 1/16 in. thick, and were used on joint ties only. With increased axle loads and heavy traffic, a large percentage of the ties are replaced on account of mechanical conditions. The subject of tie plates has been one of the big problems that the New York Central Lines Engineering committee has been trying to solve. The committee has decided on a tie plate 7 in. wide and ¾ in. thick, made proportionately in length to the rail sections we are using.

The first rail was of strap iron. The first "T" rail weighed 40 lb. per yard; it was later increased to 56 lb., then to 60, 65, 67, 70, 75, 80, 100 and 105 lb. Two years ago we tried out a 115-lb. section and we are going to install 127-lb. Dudley section rail in 1926 which is 7 in. high and has a 6¼-in. base For the time being this will be our standard rail for main line traffic. Really, for our lines east of Buffalo, the standard sections are the 127-lb. rail for our two high-speed tracks, and the 105-lb. 6-in. rail for the other lines. This 127-lb. rail, we feel, will improve general conditions in our track structure and maintenance, and give us a much higher factor over the present rail, and a rail approximately 62 per cent stiffer than the present 105-lb. rail.

With it we are going to use open-hearth, heat-treated, oil-quenched splice bars, 38 in. long, for the three-tie supported joint. A number of the railroads use only two-tie joints or the suspended or floating joint but we feel that the supported joint gives better riding track and better joint conditions, particularly in reducing battering of the rails at the ends.

In early days ballast was sand, gravel and cinders. With increased axle loads and denser traffic a more permanent ballast, such as washed gravel, crushed hard slag and crushed hard limestone is required.

General maintenance work requires a large amount of special equipment, including 2 rotary snow plows, 45 push snow plows, 67 snow flangers, 10 snow sweepers, 13 steel Jordan spreaders, which are used for ditching, spreading and doing miscellaneous work, and for handling snow; 25 work train derrick cars, to use for unloading and loading rails and miscellaneous track material; 10 locomotive cranes equipped with pile driver leads, steam hammers, magnets, clam shell buckets, etc.; 7 bridge erecting cranes for erecting bridges, etc.; 7 track pile drivers, 7 steam shovels, 750 ballast cars, which are used in the summer for handling stone ballast, etc., and in the winter for handling fuel and supplies, etc.; 113 Clark air dump cars used for steam shovel, grading and other miscellaneous work, handling rip rap, cinders, etc., in winter; 30 King Lawson air dump cars; 6 steam ditchers for doing ditching and similar work; 3 weeding cars for digging up weeds and breaking up the ballast where it has become foul and hard; 1 Neafie oil spraying car for spraying oil to preserve the rail, splice bars, spikes, bolts, tie plates, etc.; 9 scale test cars; 750 motor cars, and 340 tie tampers. This equipment represents an outlay of approximately $3,750,000. Besides this we have a quantity of small miscellaneous equipment.

We have safer, better and smoother riding track today than we have ever had, with fewer derailments. I have made an analysis of the cause of 40,000 derailments, with this result: Operation, 48.6; equipment, 35.4; unavoidable, 11.0, and maintenance of way, 5.0 per cent. Of derailments charged against the maintenance of way department, few were attributed to main line conditions. A large percentage of them were due to the maintenance of private side tracks.

In traveling over the road to observe conditions I find that the things most neglected are proper instructions to foremen and the improper use of tools and material. Supervisors and others, I feel, are transmitting too many orders by letter. A spoken word is worth more than twenty on paper. The majority of the foremen who are doing work wrong, in my estimation, have not been properly instructed.

Personal contact will tend to improve relations as well as improve the efficient use of labor and material, thus reducing expenses and raising the morale. I believe that a number of supervising officers could improve conditions by having a little more tact in this respect, and also by seeing that their men have the proper tools and material for the work assigned them. When foremen want help, see that they get it. Confer with them more often and weigh their suggestions. President Crowley has remarked that "a five-minute talk is worth more than a thirty-day suspension, and in the end will pay a larger dividend for the company." By working along the lines I have indicated you will help the management improve conditions and promote economical operation.

System Gangs Cut Rail Laying Costs 20 Per Cent

St. Paul Has Replaced Division Forces with One Crew on Each General Superintendent's Territory

WITH the present year the Chicago, Milwaukee & St. Paul inaugurated a new policy in relaying its rail which calls for the assignment of one large rail laying gang to each of the four general superintendents districts into which the road is divided, each of these districts comprising approximately 2,500 miles of road. These gangs lay all the main line rail, both new and relay, instead of having the work performed by numerous gangs under the jurisdiction of the division roadmasters as has heretofore been the custom. Under the new plan each gang is composed of from 100 to 125 men, under the charge of a roadmaster specially assigned for the season and which proceeds under a program made up by the engineer maintenance of way and the general roadmaster of the system. Rail laying on this road has been carried on under the new plan since last March and the results obtained have been satisfactory in all respects and have effected a saving of approximately 20 per cent in cost as compared with that of previous years.

Various considerations led to the adoption of this policy, chief among which were the element of cost, the value of having a fixed and orderly program which would simplify the ordering and shipping of material, the expediting of the work and the advantage of securing uniform results in conformity with the company's standards, with a minimum of supervision. This plan also simplifies the programming of work on each division where rail is to be laid as the time that the work will be done can be estimated closely and plans that are contingent on the laying of the rail can be made accordingly. In addition, the supervisory forces of the division, being relieved of this work, can devote more attention to other maintenance matters.

A Program Is Prepared

As soon as the budget has been approved, A. F. E.'s for all rail laying jobs are prepared and a form is drawn up on which are shown the divisions on which rail is to be laid, the location of each job, together with its mileage and tonnage of rail, and the A. F. E. number. Further columns are provided for the different classes of rail to be received and space is left in these columns so that notations may be made as the amount and date of shipment to each job.

When the rail is purchased for the season's requirements arrangements are made to receive a certain tonnage each month. As the rail is received at Chicago the general roadmaster's office is notified immediately and the cars are at once reconsigned to the points where the rail is needed. Requisitions for angle bars and other track fittings are also made on the store department in accordance with the plan to have all of the materials unloaded for all but the larger jobs in advance of the arrival of the rail laying gang, the distributing of the material being done by work train under the supervision of the division forces. On the larger jobs it is usually undesirable to ship and unload all the material before the work is started, but a substantial proportion of it is distributed in advance of the beginning of work, the remainder being shipped as needed and distributed by the wok train which is provided for each rail gang.

Organization of the Gangs

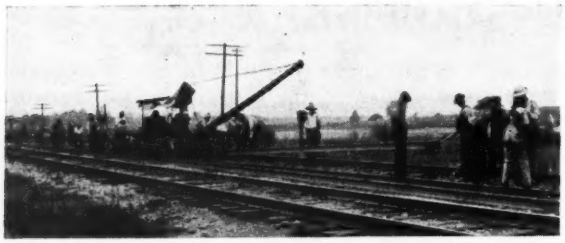
The rail gangs are organized on the basis of from 100 to 125 men, depending on the availability of labor and the conditions of the work to be done. The rails are set in one at a time by gasoline operated cranes mounted on self-propelling car bodies, three of the gangs being equipped with Krausch and Weber machines, and the fourth with a "steel burro," manufactured by the Cullen-Friestedt Company, Chicago. The practice ordinarily is to lay the rail on one side of the track one day and that on the other side the following day. When conditions permit, the inner rail on curves is laid first as better results in gaging the rail on curves can be obtained by this method. The make-up of the gang is varied from time to time as dictated by fluctuations in the number of men or by conditions that may tend to throw the progress of the different parts of the work out of balance. A typical distribution of labor for a 100-man gang is as follows:

No. of Men	Kind of Work
1	Oiling rail
1	Hanging anglebars
12	Pulling spikes (2 hammer men included)
4	Throwing out old rail
3	Setting and driving tie plugs
2	Scoring ties for adzing
16	Adzing
3	Applying tie plates
3	With rail machine
2	Distributing small material with push car
16	Spikers (2 nippers included)
4	Bolters
1	Tightening bolts
1	Removing shims
2	Applying anti-creepers
1	Removing anchors from old rail
8	Disconnecting old rail
2	Sorting and piling scrap
3	Cleaning track
2	Grinding tools
1	Water boy
10	With work train loading released material
2	Flagmen
100	

Adzing and pulling spikes are usually the two items of the work that are subject to the most variation in progress and careful attention is needed to keep them in proper relation to the work as a whole. On important main lines it is now the practice to use tie plates on all ties and where this was not done on the old rail, or if new tie plates are to be used all the spikes are pulled and the new plates are laid in position on the ties before the new rail is set in. One man, usually selected from a bridge gang

and ranking as an assistant foreman, scores the ties in advance of the adzers and has supervision over their work.

The application of the anti-creepers follows closely behind the laying of the rail so that the rail is fully anchored at the end of each day's work. One or two men are assigned in each gang to look after the tools, to make such repairs as can be made readily in the



Setting In Rail with a Power Machine

field and to sharpen the adzes, an emery tool grinder for this purpose being affixed to one of the trailer cars which is kept close up behind the rail machine. A small push car coupled to the rear of the rail machine carries a supply of extra tools.

An interesting adaptation of an Idol track liner for lifting the old rail free from the ties has been developed on one of the gangs. The base of the track liner is set on a tie in such a position that the end of the lining lever engages the under part of the head of the rail and little effort is required to raise the rail sufficiently to allow it to clear spike stubs and rail cut ties and to be lined over out of the way by two men who follow with bars, the work proceeding rapidly and with little fatigue on the part of the men.

Supervision of the Gang

The supervisory force for each gang consists of the roadmaster in charge who acts as general foreman with full authority and who usually looks after the laying of the rail while keeping in touch with the progress of the entire work, and changing the assignment of the men as necessary to secure the best results; an extra gang foreman who is usually in charge of the work train assigned to each gang and who looks after such other work as may be assigned to him by the general foreman, such as changing out turnouts, etc.; and three assistant foremen, one of whom, as has been mentioned, is in charge of the adzing, while the other two are usually assigned to the squads engaged in pulling spikes and in tightening bolts and gaging and spiking behind the machine.

Rail Is Laid Against the Traffic on Double Track

On double track the exclusive use of the track on which rail is being laid is provided whenever possible during the working hours and the rail is always laid against the current of traffic. Where rail must be laid under traffic, this practice avoids interfering with the work of the men following up the rail machine when a train must be held to permit a closure to be made and also avoids the opening up of the expansion by the passage of the train before the anti-creepers have been applied.

Two gangs follow the rail-laying machine, one to spike and gage the new rail and to tighten the bolts and one to uncouple the old rail. The rail is full spiked and gaged as the work progresses but the ties are not spaced, this being left for the surfacing gang which ballasts the track after the rail laying is completed. Where Barrette anti-creeper tie plates are used in addition to other types of anti-creepers they are hooked onto the flange of the rail but are not fully applied until done by the surfacing gang, to avoid having to loosen them for the purpose of spacing ties.

In uncoupling the old rail the nuts are wrenched off whenever this can be done economically; otherwise they are cut off with a chisel. Great variations are found in this work, ranging from 95 per cent salvage of the old bolts and nuts where the angle-bars have been oiled at regular intervals to about 5 per cent where oiling has been neglected and where the bolts have been exposed to brine drippings from refrigerator cars. Where it has been necessary to cut the nuts off it has at times been possible to obtain an acetylene torch and operator from the mechanical department and thus effect economies in this work. Owing to the intermittent demands for such an outfit it has not been deemed expedient to assign one regularly to each gang.

Labor Is Recruited by the Company's Employment Bureau

The gangs are composed of "hobo" labor, recruited by the company's own employment bureau from the larger cities on its lines. Camp cars equipped with bunks and tables are furnished by the company and the boarding of the men is done by a contractor who furnishes the bedding and the food, subject to the supervision of the company. The camp cars are moved from station to station as the work progresses, care being taken to select a telegraph station whenever possible. The men are carried to and from the work on large trailer cars hauled by the rail laying machine which will transport the entire gang at the rate of about 10 or 12 miles per hour. It has been found that the labor turnover in these large gangs is much smaller than is the case with the same number of men distributed among several smaller gangs.

Throwing Out Rail with an Idol Track Liner

A work train equipped with a pneumatic hoist rail loader taking air from the train line is assigned to each gang to unload new rail and other track materials and to pick up the old rail, fittings and scrap. A gang of from 10 to 15 men accompanies the work train and this gang in some cases is composed of Mexicans, who board themselves in camp cars furnished by the company. The picking up of the old material follows closely behind the laying of the new rail so that when the latter is completed on any particular job there is no delay in closing up the work and moving the gang to its new location.

As the released rail on the eastern lines is loaded, it is shipped to the company's reclamation plant at Savanna, Ill., where it is classified for relayer use and sawed and drilled or otherwise reconditioned, experience having demonstrated that the classifying of the rail can be done more economically at the recla-

mation plant than in the field. The rail laying program is of great value to the reclamation plant since it is thus enabled to anticipate its requirements within close limits and to plan its work accordingly. On the western lines, which extend from the Missouri river to the Pacific Coast and which comprise one general superintendent's district, the old rail is sawed under contract at Seattle to avoid the long haul to and from Savanna.

Daily reports are mailed to the office of the engineer maintenance of way, showing in detail the telegraphed the store department that his rail bender was broken and that unless he received one by the following morning his progress would be delayed. The message was received after the storehouse had closed for the day, but the operator, impressed with the urgency of the case, located the storekeeper by telephone and read him the message. The storekeeper, equally impressed got one of his men to accompany him to the storehouse where they secured a rail bender and took it to the passenger station in time to send out by train baggage on one of the

WEEKLY COMPARATIVE STATEMENT OF STEEL GANGS WORKING-LINES EAST

Div. Illinois ..... Gang No. 6 .... Foreman Boland ..... Location 7/12&13Fairdale,Ill. AFE No. 17084 ...Date 7-12 to 7-18, 1926
7/14-18Kirkland,Ill.

Date	No. of Laborers	Total hours worked by laborers	Watchman	Flagmen	Waterboy	Toolman	Cooks	Dist. Rail & Fastenings	Pulling Spikes	Throwing out old rail	Adzing Ties	Driving Plugs	Laying Rail	Lineal feet of rail laid	Spiking	Bolting	Applying Tie Plates	No. Tie Plates Applied	Applying Rail Anchors	No. Rail Anchors Applied	Unloading old rail	Removing Shims	Loading Rail(old)	Oiling Rail	Hanging Angle Bars	Drilling Holes	Knocking out old Pins	Removing Rail Anchors	Filing	Cleaning Track	Applying Rail Creepers	No.Rail Creepers Applied (Narrative)	Picking up scrap	Painting Rail Ends	Sawing Ties	Train Delay	Grinding Tools	Applying Joint Plates	No./Plates Applied	Laying & Tamping	Moving S.B. Gangs	Spoiling Ballast	Moving Camp	Shoveling Ballast	Putting in & Switch	Unloading Ballast	No. of Track Foremen	No. Asst. Foremen	No. Timekeepers	No. Gas Operators
July 12	101	877		9	9				89	36	110	18	27	6084	120	36	27	2808	9	624	138	9	90	9				18	9	108																	1	1	1
" 13	113	975	9		9	9			102	36	220	18	27	8580	210	36	27	3960	9	880	99	9	27	9				18	9	27																	1	1	1
" 14	123	1021	9		9	9		75	120	36	220	18	27	8385	164	45	27	3870	9	860	99	9		9				18	9	23																	1	1	1
" 15	108	903	9		9	9		66	128	36	180	18	27	7100	140	36	27	3276	9	728	90	9		9				18	9	54																	1	1	1
" 16	97	810	9		9	9		30	162	36	180	18	27	6825	149	36	27	3150	9	700		9	28	9		18		18		27																	1	1	1
" 17	102	912	9		9	9		84	198	36	206	18	27	7449	183	36	27	3438	9	764		9		9		45		18																			1	1	1
" 18	1	9	9																																													
Total	641	5496	54		54	54		255	959	216	1116	108	162	34483	966	228	162	20502	54	4556	396	54	145	54		63		108	36	239																	6	6	6
Aver-age Per Day	107	916	9		9	9		43	160	36	186	18	27	7404	164	36	27	3417	9	759	66	9	24	9		32		18	9	40																	1	1	1

Div. C. & N. ..... Gang No. 1 .... Foreman Natzel ..... Location Walworth, Wis. .... AFE No. ..... Date 7-12 to 7-18,1926

July 12	114	990	10	20	20	10		80	60	30	116	20	20	7134	100	60	30	3080	10	540	60	10	40		20	20	5		40	15	2290	10	10	20		20	5	360		30							1	3	1	1
" 13	122	1158	10	20	20	10		100	60	30	128	20	20	7468	110	60	30	3072	10	584	90	10	100		20				60	15	1852	10	10	20		20	5	384	58	30	5						1	4	1	1
" 14	108	1062	10	20	20	10		100	60	20	120	20	20	8608	111	50	30	3876	10	652	68	10	100		10		10		40	15	2264	10		20		20	5	430	58	30	6						1	4	1	1
" 15	108	1018	10	20	20	10		100	60	20	120	20	20	7644	120	70	30	3134	10	592	120		100		10				60	15	1776		10	20		20	5	392		30	6						1	4	1	1
" 16	108	983	10	20	20	10		100	60	20	120	20	20	7098	125	60	30	2918	10	544	80		100		10				40	15	1520		10	20		20	5	344		30	6						1	4	1	1
" 17	117	1069	10	20	20	10		80	60	20	120	20	20	8680	120	40	30	2808	10	576	60	10	100		10		10		40	15	1896	10	10	20		20	5	376	150	30							1	4	1	1
" 18	47	376																									25													350							1	2	1	
Total	672	6367	60	120	120	60		560	330	140	747	120	120	52822	686	330	180	19784	60	3908	470	40	540		90	45	25		280	90	2736	40	80	120		120	30	2304	380	180	30						6	20	6	6
Aver-age Per Day	112	1061	10	20	20	10		93	55	23	125	20	20	7304	114	57	30	2964	10	568	78	7	90		13	23	4		47	15	1132	10	10	20		20	5	368	108	30	7						1	3	1	1

Div. I.&M. 7/12&13 ..... Gang No. 1 .... Foreman Sanders River 7/14to7/18. Location Ridgeway,Minn.7/12&13 AFE No. 17207(Riv.Div.) Date 7-12 to 7-18, 1926 Richmond,Minn.7/14-18

July 12	110	990	9	18	18	18		16½	110½	18½	110	15½	24	6246	122	55½	156	2724	3½	532	200	9½		5½	5½					150	8½	1061	63																1	3	1	1
" 13	107	981	9	9	9	9															225									175		541											404						1	3	1	1
" 14	109	925	9	9	18	18		27	162	27	137	27	27	9067	234	90	27	4156	18	1064				9					36	9	1284														360		1	4	1	1
" 15	98	970	9	9	18	18		27	162	27	153	27	27	8316	207	81	27	4608	18	1152		9		9					36	9	1152																	1	3	1	1
" 16	96	842	9	9	18	18		27	135	27	135	27	27	8814	166	72	27	4016	13	904		9		9						9	904														180			1	3	1	1
" 17	90	817	9	9	18	18		27	162	27	153	27	27	8892	164	72	27	3648	9	912		9		9						9	912												324				1	3	1	1
" 18	1	8	8																																														
Total	610	5433	54	63	99	99		124½	751½	125½	688	124½	132	47837	893	370½	273½	20159	62½	4564	425	28½		5½	4½					397	4½	5096	117½										404½		360½	XX	36	6	18	5	6
Aver-age Per Day	102	906	9	10	17	17		22	122	21	118	21	21	7873	149	62	21	3659	10	761	71	5		1	7					66	7	849	59																1	3	1	1

A Weekly Performance Record of Three of the Gangs

number of laborers, the total hours worked and the full labor distribution to the various parts of the work, together with the number of feet of rail laid and the number of tie plates and rail anchors applied. As these reports are received they are tabulated on one sheet in the form of a weekly statement showing this detailed information for each of the four gangs, thus affording a ready means of comparing the results obtained by the different gangs.

Aside from the direct results which are secured by this practice in laying rail, there are many advantages which, although intangible, are none the less of value. The workings of the plan have demonstrated that it has developed a high degree of co-operation between the maintenance department and the transportation department, part of which is due to the fact that there is only one gang at work on any one general superintendent's district instead of several and that it is thus easier to cultivate the spirit of co-operation than when several gangs are working at different points, and to have an understanding between the general foreman and the dispatcher so that each may realize the importance of avoiding all possible delays to either traffic or to the operations of rail gang. The size of the gang itself often causes other departments to make a special effort to expedite its progress which they would not do in the case of a smaller outfit. As illustrating this feature, an incident is related where a foreman of one such gang night trains. The rail bender arrived at the gang's headquarters early the next morning and no delay resulted. The present season's program called for the laying of approximately 100 track miles of rail for each gang and the work has progressed in close conformity to the preliminary schedules.

The planning of the new program was done by W. H. Penfield, engineer maintenance of way, and W. Shea, general roadmaster, and the details of putting it in effective working order were carried out under their supervision.

A Well Kept Railroad Lumber Yard

What a Section Foreman Thinks of Uniform Forces*

By Clarence J. Jones
Section Foreman, Missouri-Kansas-Texas, Georgetown, Tex.

INCREASED costs of labor and material, the ever-increasing competition between railroads, and the rapid advance of the automobile and truck as short haul competitors, make economy not only desirable, but absolutely necessary in every department. It should be remembered, however, that economy which is not the result of trained and well-directed efficiency will be of small benefit. That much being granted, the average section foreman wonders at what to him looks like a lack of efficiency in his department and in the interest of greater efficiency, I make this appeal, in the hope that in the end we may be better satisfied and contented in our line of work at no expense to the company, but instead to the company's gain.

Contrary to the opinion of some, the foreman's job is no "pipe," and he has much to do and think about besides hunting for a low joint and raising it and then looking for another one. His task is not done by simply keeping his track safe, but rather it is his duty to strive constantly to improve the physical condition of the property entrusted to his care. This includes keeping all the track under his charge in a safe condition at all times, keeping in repair all side tracks, switches and other industrial tracks, keeping in repair all right-of-way fence, gates and cattle guards, keeping the right-of-way clean, looking after the care of station grounds, protecting all company property and material from fire by providing the necessary guards at the proper time, keeping ditches cleaned out and looking after the drainage condition over his section as well as other small details that arise from time to time. It is therefore very important that he keep his work well planned in advance, and unless he plans efficiently, he has lost before he starts.

The most disagreeable fact the foreman has to contend with in laying out his work program is the uncertainty of his labor allowance. He knows that starting with January and up to the first of June, he must give his tie renewals preference. He knows that during the summer months, due to the heat and the lack of sufficient ballast in so many places, the less he does to his track the better off he will be, and he knows, too, that during the summer months he will have to burn off the right-of-way and cut fire guards wherever needed. With the approach of autumn, he will have to get all track ditches cleaned out, the grass cleaned off the track and he will have to give some attention to the right-of-way fences. This done, he will have a lot of spotting and lining to do over the entire section before the year draws to a close. In addition, the foreman remembers that some time during the year he should go over his entire section, tightening bolts, and that he must give attention to the side tracks and switches. All of this he wants to do, but how many men will he have with which to do all this work? Two men this month, maybe three next month or maybe four, and then maybe only two again. Can the foreman efficiently plan a year's work ahead under such conditions?

I do not know upon what basis or for what length of time the appropriations are made. It may be that there are good and sufficient reasons why the present method must be continued, but it does look to the section foreman like an utter lack of efficiency. He does not like to fall way behind in his work program this month, only to run way ahead of it next month and be forced, probably, to do the work when the time is not yet ripe; finally to have his plans so demoralized that he finds at the end of the year, after taking an average of five men's time, that he has not accomplished as much as he would have, had he only worked three men for the entire year.

Considering the fact that practically any kind of work can be carried on in the South the year 'round, and the further fact that the average labor hours, per section, per year, will run around 11,000, it would appear that appropriations made on a yearly instead of a monthly basis would tend to greater efficiency.

If the section foreman were given a definite number of men for the year, he would set about to get three or four (as the case may be), old reliable, steady workers, who would appreciate a regular job and in return would give a fair day's work; men who understand the proper method of handling and applying all kinds of material, who also understand the safe handling of motor cars and hand cars, most of all, men who understand the principles of safety. No explanation is necessary to point out the saving in this over the present method of hiring and breaking in new men continually. There are many of these old workers left; once they were well represented on every section, but tired of being hired and fired and hired and laid off again, they have taken up other lines of work.

I am going to submit a proposition. I have one of the hardest, if not the hardest, sections of my roadmaster's division. I do not mention this as a kick or a wail, for I am not dissatisfied with my lot yet, though there are a number of improvements I would like to make that I have never been able to get to. I have given considerable thought to the matter and while not claiming to know it all in track work, I believe I can successfully carry out the proposition I am making herewith.

If given an allowance of four men for a period of one year, I will, during that time, keep my track in as good condition or better than in the past. I will renew approximately 1,700 main line ties and 400 sidetrack ties. I will put my right-of-way fence in stockproof condition. I will improve drainage conditions wherever possible. I will give attention to all conditions that are ordinarily the duties of the section foreman. I promise that at the end of the year my section will be in better riding condition, better physical condition and will present a better appearance than at present; it being agreed, of course, that the company will supply the necessary material at the proper time.

I have tried to point out the need for more efficiency in the track department. The above offer, should it prove acceptable, would be a step in that direction and greater economy would result.

*Abstracted from a letter in the May issue of the M-K-T Employees' Magazine.

Storm Ties Up Traffic.—An unprecedented rain storm in New York city on Thursday afternoon, August 12, when 3¼ in. of rain fell within 1 hr. 10 min., flooded the tracks of the subways in several places and flooded the four tunnels of the Pennsylvania beneath the East river to such an extent that traffic was not fully resumed for about 24 hours. It was estimated that the water in the four Pennsylvania tunnels under the East river amounted to 1,500,000 gal.

What's the Answer?

What Our Readers Have to Say on Current Questions That Perplex Those Engaged in Maintaining Tracks, Structures and Water Supply Facilities

QUESTIONS TO BE ANSWERED IN THE NOVEMBER ISSUE

1. *What special precautions should be taken when the heads of rails have been nicked by the passage of a broken wheel?*

2. *What are the relative merits of steam hammers and drop hammers for pile drivers on maintenance work?*

3. *Does the spraying of the roadbed with oil to keep down the dust reduce the efficiency of the ballast?*

4. *To what extent should a railroad provide the tools used by water supply repairmen?*

5. *When making a heavy raise in two lifts on stone or gravel ballast under traffic, how closely can the second lift follow the first?*

6. *Should the roofs of roundhouses be insulated?*

7. *What measures should be taken to insure the maintenance of crossing plank in good riding condition for highway traffic?*

8. *Is there any practical way to determine in the field whether gravel from an untested source will be satisfactory for concrete?*

Cleaning Bridges By Sand Blasting

Under what conditions is the sand blast economical in cleaning steel bridges preparatory to repainting?

Economical Only Where the Metal Is Badly Rusted

By Clark Dillenbeck

Assistant Chief Engineer, Reading, Philadelphia, Pa.

On small bridges I do not believe it would be economical. As regards large structures or viaducts, I doubt whether there is any economical use for the sand-blast if the bridges are painted as often as they should be, that is, if there is very little bare or rusted metal. If, however, a structure is left for repainting until the paint has practically disappeared and the metal is badly rusted, I believe it would be conomical to use the sand-blast.

It Depends on the Amount of Work to Be Done

By E. M. Grime

Engineer of Water Service, Northern Pacific, St. Paul, Minn.

The advisability of using sand blast apparatus for this purpose will depend almost entirely on the amount of work to be done and the equipment available. If a light gasoline-driven portable outfit is at hand it will pay to use it on almost any work where more cleaning is necessary than can be handled readily by the painter, using his scraping knife or brush as he proceeds with the painting.

In the painting of large bridges where considerable cleaning is necessary the sand blast is indispensable for first class work. On a large job undertaken by the writer in 1917 before labor costs had risen, the steam boiler at a pumping station adjacent to the work was utilized to operate a 10½-in. cross compound air compresser and the air was piped a distance of 2,000 feet. A reservoir in the line served to absorb the surge due to the operation of two sand blast outlets and a pressure of 60 lb. was carried at the nozzles. In this case the air compresser was about the only out-of-pocket expense. This was a 7,000-ton structure and about 50 per cent of the surface required thorough cleaning. The total cost of the sand blasting amounted to 20 cents per ton.

When steel is cleaned by the sand-blast method, the work should be followed immediately by a coat of paint as it has been observed that a thin film of rust will form on the newly cleaned surface within a few hours if it is not protected in this way.

Economical For Certain Conditions

By Engineer Maintenance of Way

Cleaning by sand blast is acceptable practice when used under the direction of a foreman who is known to possess good average intelligence and who is interested in his work. The use of the sand blast is economical where a compressor outfit is being used for redriving rivets and for spray painting, and where the steel structure shows excessive corrosion due to deferred maintenance, in heavy soft coal mining, blast furnace or coking districts. Cleaning by the use of hand tools is preferable and more economical where the deterioration is light.

Conditions Where Sand Blasting Is Economical

By A. E. Bechtelheimer

General Inspector of Bridges, Chicago & NorthWestern, Chicago

I believe that the sand-blast is economical in cleaning steel bridges preparatory to repainting, when (a) the steel superstructure has been neglected after erection so that the shop coat has peeled and the entire

surface is covered with rust and paint scale, (b) the steel superstructure has received systematic repainting over a period of 20 years and the paint film has become so very dry and hard that it checks, peels, and blisters when repainted, (c) the parts of a steel superstructure are subjected to unusually severe conditions, such as accumulations of dirt which holds moisture, water dripping through leaky ballasted floors, brine drip from meat cars, coal and cinder dust, all of which cause such heavy rust and corrosion scale that the surface, even after good hand cleaning has been done, is not in good condition to receive the paint.

Keeping Maintenance Tools in Good Condition

What measures should be taken to see that the tools used by maintenance gangs are at all times kept in a safe and serviceable condition?

A Program for Maintaining Tools in Good Condition

By H. M. Lull

Chief Engineer, Southern Pacific, Texas and Louisiana Lines, Houston, Tex.

In the first place it is essential that tools of good quality be furnished. It is especially important that such tools as chisels and drills be of the best quality obtainable.

New tools should be furnished promptly for the replacement of worn out tools.

Tools should be used only for the purpose intended so that only natural wear will occur.

A daily inspection should be made by the gang foreman when tools are loaded preparatory to starting for work, and only tools in good condition should be taken along.

Roadmasters and division officers should make it a practice to observe the condition of track tools while going over the line. It should be the duty of the roadmaster to keep himself informed as to the general condition of the track tools in use on his district, making sure that replacement tools are requisitioned when needed and that they are furnished promptly by the store department.

On these lines and on many other roads it is the practice to run a supply train at intervals of about 60 days, distributing tools and supplies to track forces, bridge gangs, stations, etc. On these trips of our supply train it is required that each section foreman have his entire standard allotment of tools spread out at the section house for inspection on the arrival of the supply train. Those tools which are in defective condition or worn to such an extent as to be no longer servicable are taken up and new or good repaired tools issued to replace them. This practice has been in effect for the past three or four years and has been found to be productive of excellent results. It insures a thorough check of the condition of each foreman's tools at least once each 60 days.

The Foreman Should Have the Responsibility

By F. R. Layng

Engineer of Track, Bessemer & Lake Erie, Greenville, Pa.

As the question indicates, there are two reasons for maintaining tools used in maintenance gangs in first class condition. The first reason concerns the safety of the men using the tools. In view of the fact that a tool may become unsafe at any period during its use the primary responsibility for seeing that tools are in safe condition rests with the men using them. The entire gang should be instructed frequently by the foreman that any tool that becomes unsafe should be set aside and put where there will be no temptation to use it. Men frequently use damaged tools rather than to go to the trouble of getting another one. The foreman should instill in the minds of the men that a tool that is out of order, or in bad repair is unsafe and must not be used. Over anxiety either to avoid delay, due to not having a sufficient number of tools on hand to promptly replace a damaged tool or their indifference to the requirements of safety, leads many foremen into the mistake of continuing to use a tool in bad repair. This practice quickly creates in the minds of men in the gang the impression that it is all right to use damaged tools. Sincerity in this matter on the part of the foreman is imperative. The second reason is from the standpoint of efficient work. Tools in proper repair are necessary to do the work properly and efficiently.

The writer is not in sympathy with any system that would take the primary responsibility for the maintenance of the tools in proper repair from the foreman. He would add frequent inspection on the part of the higher supervisory officers, especially the supervisor or road master. He is convinced that the tendency to appoint inspectors to check the work of foremen and supervisors is wrong, and that whatever efforts are made should be along the line of insisting that the foremen and supervisors properly perform their duties. There should be a rigid investigation of every accident from the use of tools not in good repair and the foreman and supervisor held primarily responsible for the accident.

Concrete or Brick For Station Platforms

What are the relative merits of concrete and vitrified brick platforms?

It Depends on Various Conditions

By A. L. Sparks

Architect, Missouri-Kansas-Texas, St. Louis, Mo.

Concrete and vitrified brick are both used satisfactorily for passenger platforms. Where platforms are covered, in locations where special architectural treatment is applied, where perfect watertight drainage is necessary or where it is necessary to scrub and wash the platform frequently, concrete is desirable. Where platforms span subways, tunnels or basements concrete is generally preferable.

When used with rough float finish and where not subject to heavy traffic concrete makes a non-skid surface, but where heavy traffic occurs a top finish hardened with carborundum or other non-skid preparation is necessary to prevent accidents from slipping. Concrete laid in cold climates in large areas is often broken by frost swelling the ground underneath.

Brick is preferable for outside platforms in cold climates or where subjected to snow and sleet, as it provides a roughened surface, preventing slipping. Brick is desirable in a platform underlaid with pipes, sewers, drains or other facilities which may require inspection or repairs, as the brick may be removed and replaced without leaving unsightly patches.

Brick surfaces, on account of their broken and varied texture, withstand great abuse and permit of many blemishes and soiled spots without presenting a bad appearance, while the same number of blem-

ishes and soiled spots on a concrete platform would present a neglected, discreditable appearance. When a brick platform settles and sags or becomes broken it can be resurfaced and repaired without showing where the repairs were made.

Tamping New Ties

When replacing ties should they be full tamped as they are put in or should this be done after all the ties for the day have been inserted?

Tamp the Ties As They Are Inserted

By W. H. Sparks
Inspector of Track, Chesapeake & Ohio, Russell, Ky.

All ties should be full spiked and tamped as they are installed. With the heavy engines and large trains now running at high speed over our tracks, we cannot take the risk of leaving anything undone that will cause weakness in the track at any time.

They Should Be Tamped When Put In

By W. H. Cleveland
General Track Inspector, Atchison, Topeka & Santa Fe, Wellington, Kan.

When resurfacing track with tie renewals, all replaced ties should be tamped in full as they are put in in order to maintain the uniform surface of the track, and also so that the ballast may be compressed under the new ties so that they will give uniform support to the rail. When the tamping of replaced ties is deferred until the close of the day's work, it invariably results in the new ties becoming loose under the rail after a short period of time, necessitating retamping.

Tamping Should Be Done as Ties Are Renewed

By E. E. Crowley
Roadmaster, Delaware & Hudson, Oneonta, N. Y.

When replacing ties that are dug in, they should be fully tamped at the same time renewals are made. In cinder, gravel and other similar ballast, ties should be tamped their full length; however, the centers of ties should not be tamped as solid as the ends and that portion underneath the rail. In stone, slag, or similar ballast, ties should never be tamped more than 18 in. inside the rail. When replacing ties where track is being pulled out of face, the center tamping is generally deferred until after several trains have passed over the portion being raised; however, all ties should be completely tamped each day.

Rendering Treated Timber Fire Resistant

Can treated timber be made fire resistant cheaply?

There Is No Sure Method Except Air Seasoning

By Hermann Von Schrenk
Consulting Timber Engineer, New York Central Lines, St. Louis, Mo.

Freshly creosoted material of any sort is more inflammable than untreated timber. I know of no way in which such timber can be made less inflammable cheaply. We have on one or two occasions covered these members with sand where it became absolutely essential to use freshly treated timber, particularly for such items as bridge ties and guard rails. Whether it was this sand protection (with coal burning locomotives), or whether it was due to the absence of sparks or cinders, we have had no fires that I know of in such cases.

The one sure way of preventing ignition on creosoted wooden structures is to thoroughly air season the creosoted material for at least six months before putting it in. After that period, the chances for ignition become less and less as the material grows older. Attention is called to the paragraph in the recently issued Handbook of the Railway Fire Protective Association, page 259, in which this matter is well stated.

My personal experience has been that fires on creosoted bridges are almost always due to something which should have been done but which was not done. Either the bridge was built with freshly treated material or sufficient care was not exercised in the design or in keeping inflammable material away from the approaches or the immediate vicinity of the bridge itself.

My answer to the question, therefore, would be that creosoted timber can be made fire resistant cheaply by air seasoning for at least six months after creosoting before using it.

Repairing Cracked Water Pipes or Leaking Joints

Can cracked pipes or badly leaking joints in a water main be repaired without shutting off the water?

It Depends On the Nature of the Break

By R. C. Bardwell
Superintendent Water Supply, Chesapeake & Ohio, Richmond, Va.

This depends largely upon the character and quality of the pipe and local conditions. If the leak is caused by a crack or split in a cast iron pipe and part of the metal has not blown out, temporary repairs can be made by clamps or bands around the pipe without shutting off the water. If the leak is in a lead joint, or a packing joint, it can be stopped by caulking or tightening the packing. If the leak is from a split seam in wrought iron pipe, clamps and caulking will afford temporary relief. If the leak is caused by stripping a thread in a wrought iron coupling, or a break in a welded joint, a convenient method of repairing consists in the use of a split sleeve clamp.

Cracked Water Pipes May Be Repaired By Clamps

By E. M. Grime
Engineer of Water Service, Northern Pacific, St. Paul, Minn.

The repairing of cracked water pipes while under pressure can often be handled very successfully without in any way interfering with the use of the main. Cast iron pipe will sometimes open up in a crack several feet long running lengthwise and this can be drawn together by means of clamps. Such clamps can be made by a blacksmith out of ½-in. or ¾-in. bar iron about 2½ in. wide. Each pair should consist of two half-circle straps formed over a templet the same size as the pipe and the turned-up ends shaped and drilled so that as the bolts on each side are tightened the crack in the pipe is drawn together. It may be desirable to lay a piece of old rubber belting over the crack. This is held in position by the clamps and assist in making a tight joint. The clamps should be placed about 18 in. apart along the pipe. Repairs made in this way are often considered a temporary expedient until a new length of pipe can

be placed, but in cases where the joint is absolutely tight and there is no further tendency to crack the repairs may be considered permanent.

The repairing of leaking joints can, in some cases, be done by redriving the lead filler but if the filler has been displaced to any extent it is advisable to shut off the water, remove the old material, place new jute, and recaulk the joint.

Care in Flagging

When a flagman is sent out what method should be used in recalling him to avoid the possibility of a misunderstanding?

Rules For Safe Flagging

By E. N. Reece

Chief Engineer, Kansas City Southern, Kansas City, Mo.

This question was discussed at our maintenance meeting, held at Sulphur Springs on July 10, because of an accident on a neighboring line which resulted from a misunderstanding between the section foreman and a flagman who had been sent out to protect trains.

We have the following flagging rule: "In case of impassable or unsafe track, flagging is the first duty. When track is impassable or unsafe to a degree that it is essential that trains come to a full stop, or pass at a greatly reduced speed, a reliable flagman must be sent in each direction with proper signals and appliances. At a point 20 telegraph poles from the point to be protected, he must place one torpedo on the right hand rail facing the point to be protected. He must then go 5 poles farther, or 25 telegraph poles from the point to be protected and place two torpedos on the rail (three rail lengths apart), on the right hand rail, facing the point to be protected. He must then return to a point near where the first torpedo was placed on the rail, but always selecting a location where he can be seen plainly from an approaching train, and, with a red flag by day and a red light by night, stop all trains, and notify the engineman for what purpose he is flagging and the exact location, and, when each train thus flagged proceeds, must immediately replace torpedos and take a position as in the first instance, continuing the protection until notified by his foreman in person, or by written notice from his foreman, to return. When returning, the one torpedo nearest the point to be protected must be taken up."

We came to the conclusion that the flagmen should remain at their post of duty, and strictly observe the flagging rule, until notified by the foreman or his representative, that the track was in safe condition for the passage of trains at normal speed. In accepting the instructions of the foreman, the flagman should come in close enough contact with the foreman to prevent any misunderstanding, either in identity or verbal instructions, and in resuming his duty in the gang the flagmen should leave out two torpedos as a warning to trainmen as specified in the flagging rule.

The Flagmen Should Know All Members in the Gang

By W. H. Sparks

Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Proper flagging is very important and there is no part of a foreman's work where he must exercise more care than in the selection of men to act as flagmen. With the speed and tonnage of the trains of the present day, the foreman must be sure that the flagman will be out far enough to enable the train to stop before reaching the point where the work is going on.

The flagman should be experienced in track work and should know the other members of the force so that there may be no mistake when the foreman sends one of the gang to call him in, even when a written message is sent to the flagman.

Tamping With a Ballast Fork

Is a ballast fork of any use as a tamping tool?

Recommended for Lifts of Three Inches or More

By M. Donahoe

General Supervisor Maintenance, Chicago & Alton, Chicago

The standard ballast fork used on our railroad has 10 tines spaced ¾ in. apart, 13 in. in length. We can use this design of fork to tamp slag and stone ballast where the track is being raised 3 in. or more. There is a ballast fork similar to the one we use except that the tines are shorter and straighter, that is more suitable for tamping as well as for cleaning ballast than our present standard fork, and which can handle more ballast and accomplish more work in tamping on a raise of three inches or more than can be done with No. 2 track shovels.

It Is Economical for Lifting Track Out of Face

By L. Coffel

Supervisor, Chicago & Eastern Illinois, Momence, Ill.

The old methods of maintaining track by "main strength and awkwardness" have passed and we must plan carefully to keep up with the speed that is demanded today; therefore, I long ago gave up the old idea of trying to raise track out of face in stone ballast and tamp it altogether with the tamping pick. The ballast fork, of course, will not apply where the track is only to be smoothed up or given a very light lift of one inch or less—but above one inch I have found by the experience of the past four years that it pays to use ballast forks to tamp with as they are at least 50 per cent faster and are much easier on the operator and therefore much pleasanter to work with.

In making a general surface on stone ballast I find that it is better to lift the track about 1½ in. or 2 in. and tamp the ties just the same as in gravel or cinders, using the forks to clean the ballast back, or cut it under, as we used to say when tamping with a shovel. By this arrangement the men can pair off and tamp opposite each other on the ends of the ties, four men following up to tamp centers. In a lift of 1½ in. the track will settle on fork tamping about ½ in. which leaves a net raise of 1 in. With a 2 in. lift fork-tamped stone ballast will settle about ¾ in. and with a 2½ in. lift there is a settlement of about 1 in.

My method is to lift the track about 1½ in. out of face. Spotting on the high places, this nearly always gives a lift at the jacks of about 2 in. and more in light sags. The jack men straighten and space all joint ties and after the stone is tamped under the joint ties it is then packed a little with the tamping pick to give the joints the advantage after the day's surfacing is done. I then drop back and raise and tamp with a pick any places that have settled out of level. I have seen, I believe, just as good results with fork tamping as with pick tamping and I know that it is productive of much more harmony among the laborers. In looking over the daily reports of surfacing for the past week I note an average of 50 ft. per man in eight hours' work. I know this progress cannot be made with picks. There may be a question whether the track will stay up as well when fork tamped as with tamping picks but I want to ask the question, "Does track stay up when tamped with picks?"

When it comes to a showdown on the above question I find that there is no difference, as my experi

ence leads me to believe that track stays up just as well and for the time being rides much easier when fork tamped, and I know the progress is much greater and it is far easier on a man to tamp all day with a ballast fork than it is to bend his back all day over a tamping pick.

The Ballast Fork Is Useful as a Tamping Tool For High Lifts

By General Supervisor

The ballast fork is furnished for the purpose of cleaning, throwing in and dressing ballast but is of no use as a tamping tool for surfacing track when renewing ties or when making a light surfacing lift. In making lifts of 2½ in. or more in stone or crushed slag ballast they can be used to good advantage for tamping as they insure that clean ballast is being put under the ties and permit fast work, although they are somewhat heavier to handle than a shovel. In spacing ties off the jack they are convenient for moving the ballast away from the side of the tie and for putting it under at the same time.

An excellent tamping tool can be made from a ballast fork which has a tine broken off on one side, by cutting off the outside tine on the opposite side, thus making the ballast fork the same width as a No. 2 track shovel, and by cutting off the worn ends of the tines for a distance of about 1½ in. These smaller forks also serve better in cleaning the cribs, dressing ballast and renewing ties, since much of the ballast in the center ditch and on the shoulder is cleaned by a clam-shell, and in addition their use saves wear on the shovels.

Economical for Preliminary Tamping Only

By Engineer Maintenace of Way

The ballast fork may be used for preliminary but not for final tamping. Where tie renewals are dug in they may be tamped with the forks and finished with tamping bars or tamping picks after traffic has passed over, before the close of the day's work. Where tie removals are made when surfacing out of face, the same remarks apply. Where more than one raise is made, the first raise may be properly tamped with forks under restriction of train speed, pending the final surface raise which should be bar or pick tamped. The ballast fork shows a definitely economical result as to time, unit costs and safety in track as applied to tamping.

Specifications For Ties Explained With Diagrams

A NEW four-page form published by the Pennsylvania comprises an excellent example of the clear presentation of specifications for cross-ties and of such supplementary information as is of use to inspectors and tie contractors. The specification is substantially a duplication of the American Railway Engineering Association specification for cross-ties as amended in 1926, the deviations being as follows: A new paragraph No. 23 has been added which reads as follows:

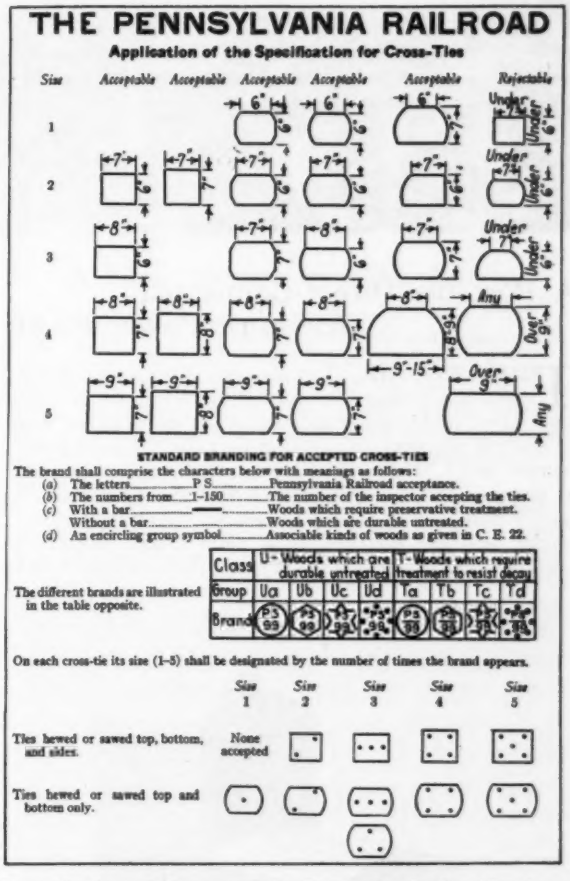
"23. Where room for spaced stacking is not available, ties may be piled together, provided the lowest layer is at least six inches above the ground; but ties so piled shall be rehandled as required for inspection."

The following woods are excluded from the lists of wood tentatively accepted for cross-ties: Douglas fir, hemlock, firs true, spruce, redwood and poplar.

Grade 1 ties, sawed or hewed, top, bottom and sides, are not accepted.

An additional paragraph No. 28 provides that cross-ties of Class T woods (to be treated) shall be impregnated with six pounds of creosote per cubic foot of timber.

Probably the most helpful feature of this specification form is a series of diagrams appearing on the fourth page illustrating the possible variations in the



Reproduction of Page 4 of the Pennsylvania Specifications for Cross-Ties

form of ties of each grade and designating which are acceptable and which are not. Information on this page also explains the method of branding and the significance of the symbols used to form the brand. This page of the form is reproduced herewith.

The user of these specifications is reminded of his responsibility in the conservation of timber by a brief statement in one part of the form by exerting his efforts to prevent fires, which statement is as follows:

Prevent Forest Fires—It Pays

Everybody loses when the woods burn. Owners lose returns from forest products; labor loses wages from harvesting and manufacturing timber crops; taxpayers lose through decreased population, industries, and land values; consumers lose the benefits of cheap forest produce from an abundant supply near at hand.

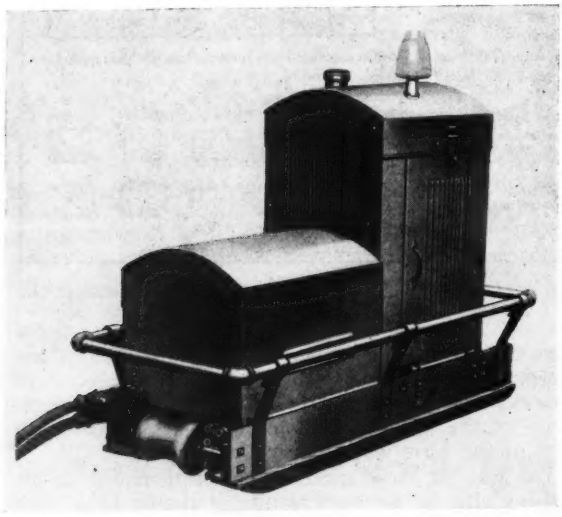
It is the duty of everyone to uphold forest-fire laws and support fire-fighting organizations; to help create sentiment adverse to forest fires, and to take all possible action to control any fires which start. Be careful with fire in the woods as you are in your home or barn, and remind others to be so. The prevention of forest fires is a personal obligation as well as a public problem.

Getting the Manufacturers' Help

Current Developments in New and Improved Labor Saving Appliances

A Portable Direct-Connected Generator Power Plant

THE ELECTRIC Tamper and Equipment Company of Chicago has recently placed on the market two direct motor-generator units for use with its line of electric tampers, in addition to its belted type four-tamper unit. These new units, which are designated as the Jackson L-2 power unit and the Jackson L-4 power unit, are of 8- and 12-tamper capacity, respectively, and are adapted to a wide range of varied uses in railroad service. They are self contained and



The Jackson Portable Power Unit with Housing in Place

are mounted on a rugged steel base which is provided with convenient handles for lifting and with grooved rollers underneath to permit them to be placed on one rail of the track in moving from one location to another. An easily removable metal weather-proof housing is provided which can be locked to prevent theft or tampering with the parts.

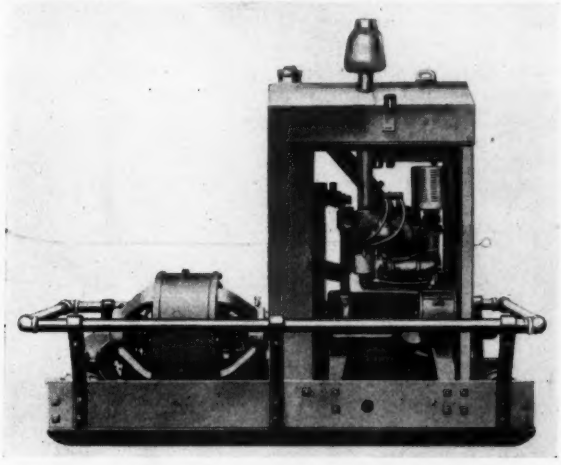
The motor of the L-2 unit is a two-cylinder, four-cycle water-cooled Le Roi gasoline engine developing 10 hp. at the normal armature speed of 1,300 r.p.m. The engine is provided with a weather proof high tension magneto and a positive gear-driven throttling governor built as an integral part of the engine. All bearings and moving parts run in oil and the lubrication is positive. The motor for the L-4 unit is a four-cylinder engine, developing 15 hp. at the normal armature speed, but otherwise similar in construction to the motor used on the L-2 unit. The generators are of the Universal type, with 6 poles, furnishing alternating current and direct current simultaneously; the direct current at 110 volts, while the alternating current is 110 volt 3-phase, 60-cycle. If desired the generators can furnish single phase or two-phase current. Close voltage regulation makes the generators suitable for lighting service and for operating standard electric tools up to the limit of their capacity. Take-off plugs are provided so that both direct and alternating current can be used at the same time. The generator has ample capacity to withstand short circuits and overloads without damage and no fuses, cutouts, instruments or protective devices are required. The armature is mounted on self-alining ball bearings running in dust proof retainers. The generator for the L-2 unit has a capacity of 4 k.v.a., alternating current and 3 k.w., direct current, while the capacity of the generator for the L-4 unit is 7½ k.v.a., and 6 k.w., respectively. The voltage range is constant between no-load and full-load.

The engine and the generator are connected by a standard Thermoid semi-flexible self-alining coupling, and either may be removed from the base independently. Since they are fully interchangeable, either the engine or generator, or both, may be removed and replaced by similar elements without machine work or the services of a skilled mechanic. The base is constructed of structural steel channels, faced with wood on the under side to serve as skids. The grooved rollers are flush with the bottom of the base, permitting the unit to set level. The unit does not require a special foundation and will operate on any fairly level location.

The L-2 unit is 48 in. in length, 18 in. in width and 36 in. in height over the engine section, while the height over the generator section is 24 in. The weight complete is 875 lb. The L-4 unit has the same dimensions except that it is 56 in. long, and weighs 1,025 lb., complete. The small size of these units makes them especially advantageous in tunnels or other places where the space is restricted, while the simplicity of the units and the absence of delicate

and intricate parts are said to avoid the necessity of a special attendant and insure satisfactory service in the hands of ordinary unskilled labor.

While these units were designed primarily for furnishing current for the Jackson electric tampers they

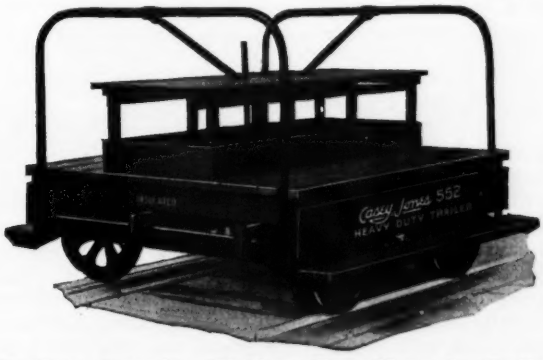


The Jackson Portable Power Unit Showing Arrangement of Motor and Generator

may be used for tunnel lighting and for emergency lighting at wrecks, for battery charging, for automatic train control current or for any portable electric tools used by the track or bridge forces.

The Casey Jones Heavy Duty Motor Car Trailer

THE Northwestern Motor Company, Eau Claire, Wis., has placed on the market a heavy duty motor car trailer, the Casey Jones No. 552, which is designed to provide safety and convenience in transporting large crews on extra gang or bridge work. The frame of the car is built of thoroughly



The Casey Jones No. 552 Heavy Duty Motor Car Trailer

seasoned oak, securely bolted together, each nut being secured with a lock nut to prevent its working loose. The frame is amply reinforced with steel braces and the running boards are supported by 2-in. by 2-in. channel irons extending to both sides of the car which also serve to brace the entire frame. The axles are 1 1-16 in. in diameter, of cold rolled steel, with the standard taper of ¾ in. per ft. for wheel fit, and run on Hyatt roller bearings provided with pressure lubrication, each bearing box having a ratchet type grease cup. The axles are equipped with easily adjustable thrust collars of the split clamp type to prevent lateral thrust and are fitted with castellated nuts and cotter keys to prevent the wheels from loosening. Pressed steel wheels with reinforced hubs are used and the wheels on one side are insulated for use in track circuit territory.

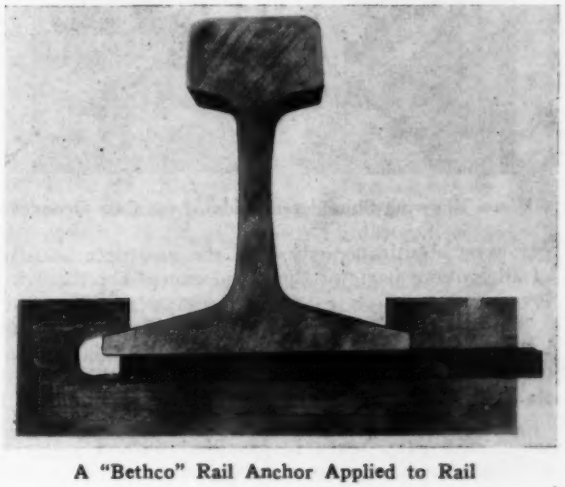
Convenient handles for lifting the car, and draw bar connections are provided at both ends of the car. The seat extends the full length through the center of the car and the space underneath the seat is arranged as a spacious tool tray. Brakes acting on all four wheels are controlled by a lever extending through the seat within convenient reach of the operator, the lever being protected by a metal guard against obstructions in the tool tray. Strong safety railings extend across the full width of the car at both ends to guard the occupants against the danger of falling off. The trailer has ample seating capacity for 20 men and a load capacity of 15,000 lb. The seat and safety railings may be removed readily to convert the trailer into a heavy duty push car.

A New Design of Rail Anchor

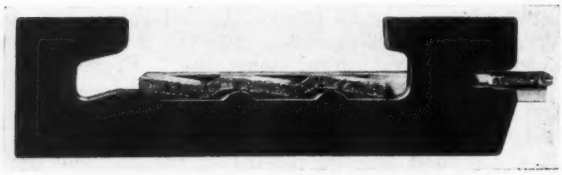
THE "Bethco" rail anchor which has been put on the market recently by the Bethlehem Steel Company, Bethlehem, Pa., meets the A. R. E. A. specifications for anti-creepers and has as its outstanding features an original design which prevents the two parts of the anchor from being separated, together with sufficient adjustment to permit it to be fitted to rails in any condition.

While the anchor is of two-piece construction, it is shipped and installed as one piece. When applied, the two pieces can be separated only with considerable difficulty and by an unusual manipulation of the parts. This two-piece construction allows sufficient adjustability to take care of more than one rail section, over or undersize rails, and the increasing tendency of rails to wear thin where they rest on the tie plates or because of corrosion.

The anchor consists of a heavy flat yoke which hooks over the base of the rail on both ends and a heavy key which is driven horizontally between the base of the rail and the yoke. This key provides the wedging action to hold the rail in place and can only be removed in a manner similar to the way that it is installed. Since there is no force acting upon the key in this direction it will not become loosened while in service. The wedging action of the key is crosswise of the rail, along practically the entire base of



A "Bethco" Rail Anchor Applied to Rail



Yoke of the "Bethco" Rail Anchor and Sectional View of the Key in Place

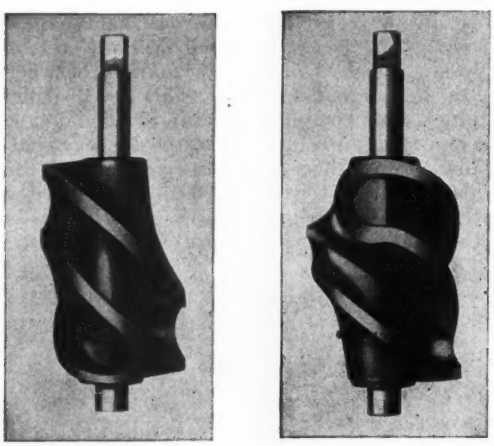
the rail. This fact, and the channel shape of the key prevent it from being forced sidewise off the yoke.

The working forces are exerted against the anchor at right angles to the yoke and key. The deep, broad surface of the yoke bears against the surface of the tie along its entire length, distributing the pressure over a large area and avoiding damage or destruction to the tie.

The installation of the anchor is simple. The yoke is hooked over the base of the rail and the key is driven home by means of a hammer, rail chisel or other handy tool, no special tools being required. Since the key cannot be dislodged except by driving, no further attention is required until renewal of the ties or other work makes the removal of the anchor necessary. Slippage of the rail through the anchor can only be accomplished by practically destroying it.

Odenkirk Switch Stand Embraces New Features

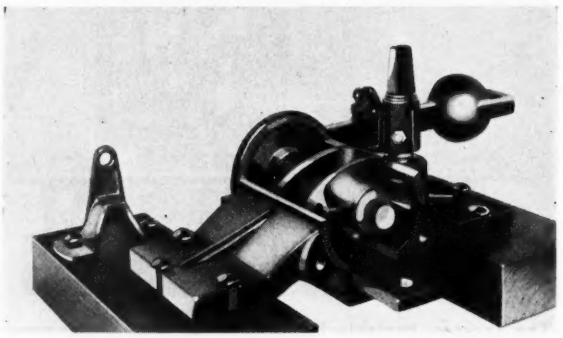
THE McMYLER-Interstate Company of Cleveland, Ohio, has recently placed on the market the improved Odenkirk switch stand which incorporates certain new features in the basic design of the old Odenkirk stand which has been manufactured for many years. These features include a double grooved cam or worm which operates the points and the target mast simultaneously, and the complete housing of all moving parts of the stand except the throwing lever.



Views Showing Shouldered Ends of the Cam Grooves

The grooves in the cam are shouldered to insure holding the points and the target in their proper positions, and the action is simple, smooth and positive. The groove which actuates the slide bar is large and the projection on the slide bar against which the cam bears is provided with a roller to eliminate friction, thus reducing wear and providing easy action. The stand is a compact unit and the design is such as to allow it to be taken apart, inspected and reassembled quickly. The castings are made of semi-steel and are said to have sufficient tensile strength to meet all railway requirements.

This stand may be used for either main track or yard turnouts, and for the latter use the connecting rod may be provided with a breakable pin which is sufficiently strong to operate the switch but which will shear off if the switch is trailed through, thus protecting the stand and points from injury. When the breakable connection is used a connecting rod with a screw adjustment is furnished, permitting adjustment of the switch points without moving the stand. The target mast is provided with a crank which is operated by a small groove in the cam and the lamp tip may be changed easily and quickly to conform to the desired position of the switch lamp.

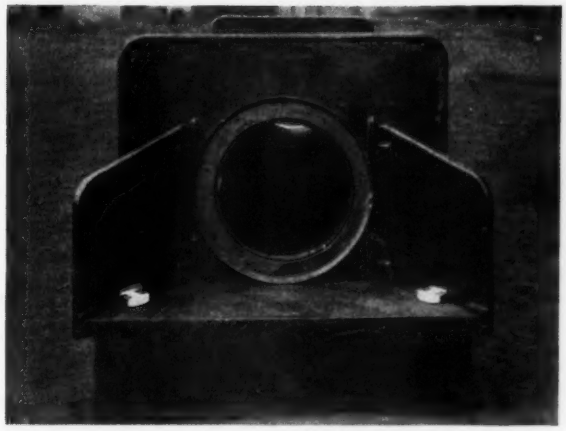


The Improved Odenkirk Switch Stand with Housing Cut Away to Show Double Groove Cam

A Cast Iron Headwall for Spiral Corrugated Cast Iron Pipe Culverts

THE American Casting Company, Birmingham, Ala., has placed on the market a cast iron headwall for use with its spiral corrugated cast iron culvert pipe which possesses the advantages of convenience in transportation, ease of installation, almost unlimited service life, and full salvage value in case the culvert is lengthened or abandoned.

Each headwall is composed of five principal parts: a lock ring, a back wall, two side aprons and a bottom apron, the latter being provided with a plate projecting downward to prevent water from working its way under the pipe. Cast iron locking keys are furnished for keying together the side aprons and the bottom apron. In assembling the head wall the back plate is slipped over the end of the pipe and the lock ring is then attached to the end of the pipe, being provided with interior threads of two diameters, the smaller of such size as to engage the thread of the outside of the culvert pipe while the larger engages tne end of the pipe known as the cuff, thus fastening it securely and preventing endwise movement in relation to the pipe. The back wall is then drawn snugly against the flange of the lock ring and the side aprons are engaged with the back wall by slipping the locking wings on the former through holes provided for them in the back wall. The bottom apron is slipped into place between keeper lugs on the side aprons and after it is in place it is further locked to the side aprons by cast iron locking keys inserted through slots provided for them, thus holding the component parts securely together and at the same



Cast Iron Headwall Applied to the Up-Stream End of a Spiral Corrugated Cast Iron Pipe Culvert

time permitting them to be taken apart quickly if desired. After the headwall is assembled, earth fill is placed and tamped behind the back wall and side aprons and under the bottom apron. The headwalls are designed to withstand all pressures that may reasonably be expected and any increase of pressure tends to lock the component parts more tightly. These headwalls are said to have given satisfactory service in a number of different installations.

The Mudge Spring Drawbar for Motor Car Trailers

MUDGE & CO., Chicago, have placed on the market a spring drawbar for use with motor car trailers which is designed to eliminate much of the shock in starting and stopping this class of equipment, which is coming into such extensive service. The drawbar can be applied to any make

The Mudge Spring Drawbar

of trailer or push car and consists of a steel bar which extends through a hanger bolted to the underframe of the car. Coiled steel springs surround the bar, both in front of and behind the hanger, the rear spring being compressed when the car is started in the forward motion, and the forward spring being brought under compression when the car is being stopped, thus avoiding the impacts which occur with rigid drawbars and minimizing the danger of injury to men riding on the cars as well as damage to the cars themselves. The drawbar may be used for cars of different heights by changing the position of the U-clamp. The device is furnished complete with bolts and nuts and it is said that it can be applied in a few minutes. The use of this drawbar is also said to enable the motor car to start heavier loads than is possible with rigid couplings

With the Associations

Metropolitan Track Supervisors Club

The Metropolitan Track Supervisors Club will hold its next meeting at the Hotel Martinique, New York City, at 12:30 p. m., on Saturday, November 13, at which time three engineers maintenance of way will make short addresses.

The Engineering Association

The Association has expended approximately $1,500 for the purchase of special equipment necessary for the continuance of the tests on the bearing values of large rollers and this equipment is now being installed in the laboratory of the University of Illinois. This equipment was purchased on the recommendation of the Committee on Iron and Steel Structures, under whose supervision tests on rollers have been in progress at the University of Illinois for several years.

The Roadmasters' Association

In addition to the program for the next convention, which was published in the August issue, page 332, J. V. Neubert, engineer maintenance of way of the New York Central lines east of Buffalo, will present an illustrated talk on Our Modern Track Construction and Its Development on Tuesday evening, September 21. Also J. S. Hyatt, general engineer of the Chicago, North Shore & Milwaukee, will speak at three o'clock on Wednesday afternoon on Building Morale Among Maintenance of Way Forces.

Practically all the spaces available for exhibits have now been assigned to the members of the Track Supply Association, aggregating 56 firms. In addition to those companies listed in the July issue, page 289, and in the August issue, page 333, the Creepcheck Company, Inc., has been assigned space.

The Bridge and Building Association

The American Bridge and Building Association will hold its thirty-sixth annual convention at the Hotel Jefferson, Richmond, Va., on October 12-14. Through the courtesy of the Big Four and the Chesapeake & Ohio railways a special train will be provided for the western members, leaving Chicago early Sunday afternoon, October 10, and arriving at Richmond late the following afternoon.

The program for the convention, so far as it has been arranged to date, is as follows:

Tuesday Morning, October 12

Convention called to order at 10:00 a. m.
Opening exercises.
President's address, C. W. Wright, master carpenter, Long Island, Jamaica, N. Y.

Report of committee on Protecting Structures Over Tracks From Locomotive Gases; F. H. Masters, assistant chief engineer, Elgin, Joliet & Eastern, Joliet, Ill., chairman.

Tuesday Afternoon, October 12

Report of committee on The Use of Motor Cars by Bridge and Building Gangs; V. Engman, chief carpenter, Chicago, Milwaukee & St. Paul, Terre Haute, Ind., chairman.

Paper on The Organization of a Maintenance of Way Painting Force, by L. B. Allen, superintendent of maintenance, Chesapeake & Ohio, Richmond, Va.

Report of committee on Pumping Equipment for Various Kinds of Service; H. H. Richardson, engineer of water service, Missouri Pacific, chairman.

Tuesday Evening, October 12

Special program.

Wednesday Morning, October 13

Report of committee on The Relative Merits of Different Kinds of Roofing Materials for Different Types of Railroad Buildings; K. Peabody, general supervisor of buildings, New York Central, New York, chairman.

Paper on The Framing of Bridge Timbers Before Treatment, by Earl Stimson, chief engineer of maintenance, Baltimore & Ohio, Baltimore, Md.

Report of committee on Methods of Repairing Disintegrated or Poor Concrete; P. G. Lang, Jr., engineer of bridges, Baltimore & Ohio, Baltimore, Md., chairman.

Wednesday Afternoon, October 13

Report of committee on The Application of Protective Coatings to Structural Steel; R. W. Johnson, assistant engineer, Chicago, Milwaukee & St. Paul, Chicago, chairman.

Report of committee on The Use of Creosoted Timber, Including the Selection of Woods Best Adapted to Treatment; C. S. Heritage, bridge engineer, Kansas City Southern, Kansas City, Mo., chairman.

Wednesday Evening, October 13

Annual dinner of the American Railway Bridge and Building Association and the Bridge and Building Supplymen's Association.

Thursday Morning, October 14

Report of committee on The Use of Compressed Air on Bridge and Building Work; F. A. Dever, division engineer, Pennsylvania, Pittsburgh, Pa., chairman.

Closing business.

It is probable that a special train will be provided to convey the members and their guests to Norfolk immediately after the adjournment of the convention where an opportunity will be afforded them to visit the coal dumpers and other terminal facilities on Hampton Roads.

Directory of Associations

American Railway Bridge and Building Association.—C. A. Lichty, secretary, 319 North Waller avenue, Chicago. Next convention, October 12-14, 1926, Richmond, Va.

American Railway Engineering Association (Works in co-operation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Next convention, Congress Hotel, Chicago, March 8-10, 1927.

American Wood Preservers' Association.—E. J. Stocking, secretary, 111 West Washington street, Chicago. Next convention, January 26-28, 1927, Nashville, Tenn.

Bridge Building Supply Men's Association.—B. J. Wilson, secretary, Pocket List of Railroad Officials, 605 Fischer Building, Chicago. Annual exhibit at convention of American Railway Bridge and Building Association.

National Association of Railroad Tie Producers.—E. A. Morse, secretary, Potosi Tie & Lumber Company, St. Louis, Mo. Next convention January 28-29, 1927, Nashville, Tenn.

National Railway Appliances Association.—C. W. Kelly, secretary, Seeberger Building, 845 South Wabash avenue, Chicago. Annual exhibition March 7-10 during convention of American Railway Engineering Association.

Roadmasters' and Maintenance of Way Association.—T. F. Donahoe, secretary, 428 Mansion street, Pittsburgh, Pa. Next convention, September 21-23, 1926, Chicago.

Track Supply Association.—W. C. Kidd, secretary, Ramapo-Ajax Corporation, Hillburn, N. Y. Annual Exhibit at convention of Roadmasters' and Maintenance of Way Association.

The Material Market

AN OUTPUT of 46,584,787 tons of steel for the 12 months ending July 31, 1926, represents the largest production of steel, by the manufacturers of the United States, in any consecutive 12 months on record. The month of August was somewhat quiet and was an off-season for railroad buying but with increased volume of business during the fall months, in which the railroads are expected to play no small part, it is anticipated that the production of steel during 1926 will be the greatest for any calendar year. The remarkable feature of this performance lies in the fact that it has taken place without any of the circumstances that in former years accompanied periods of maximum demand and production. In other words, prices have remained remarkably stable, and deliveries have been exceedingly prompt.

August was no exception to this rule; in fact, prices were increasingly steady after the moderate weakness manifested during July. As a consequence the quotations in the table below for the month of August present almost no change from those of July.

PRICES PER 100 LBS.

	July		August	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	$2.80	$2.90	$2.80 to $2.90	$2.90
Track bolts	$3.90 to 4.15	3.90	3.90 to 4.25	3.90
Angle bars	2.75	2.75	2.75 to 2.75	2.75
Tie plates, steel	2.25 to 2.35	$2.25 to 2.35	2.75	2.75
Boat spikes	3.25	3.25	3.25	3.25
Plain wire	2.50	2.55	2.50	2.55
Wire nails, keg	2.65	2.70	2.65	2.70
Barb wire, galv.	3.35	3.40	3.35	3.40
C. I. pipe, 6 in. 12 in., ton		48.20 to 49.20		47.80 to 50.20
Plates	1.90	2.10	1.90	2.10
Shapes	2.00	2.10	2.00	2.10
Bars, soft steel	2.00	2.10	2.00 to 2.10	2.10
Rivets, struct.	2.50 to 2.60	2.75	2.50 to 2.60	2.65 to 2.75
Conc. bars, billet.	2.00 to 2.10		2.00 to 2.10	
Conc. bars, rail	1.80 to 1.90	2.00	1.80 to 1.90	2.00
Rail, per gross ton, f.o.b., mills		43.00		43.00

After moderate advances during the month of July, the prices for scrap have again been subjected to weakness with the result that some minor declines occurred in August, as shown in the table of prices below:

PER GROSS TON

	July	August
Relaying rails	$26.00 to $31.00	26.00 to $31.00
Rails for rerolling	17.25 " 17.75	17.00 " 17.50
Rails less than 3 ft. long	17.50 " 18.00	17.50 " 18.00
Frogs and switches cut apart	16.00 " 16.50	16.00 " 16.50
Steel angle bars	16.50 " 17.00	16.25 " 16.75

The lumber market is experiencing the normal late summer lull, with a resultant falling off of unfilled orders and a moderate weakening of prices, although as usual these are not indicated in the published quotations for Douglas fir.

SOUTHERN PINE MILL PRICES

	July	August
Flooring, 1x4, B and B flat	$45.68	$44.53
Boards, 1x8, No. 1	37.90	36.27
Dimension, 2x4, 16, No. 1, common	29.42	28.29
Dimension, 2x10, No. 1, common	29.07	30.06
Timbers, 4x4 to 8x8, No. 1	28.28	28.31
Timbers, 3x12 to 12x12, rough	45.40	42.06

DOUGLAS FIR MILL PRICES

Flooring, 1x4, No. 2, clear, flat	$27.00	$27.00
Boards, 1x8, 6 to 20, No. 1, common	16.00	16.00
Dimension, 2x4, No. 1, common	17.00	17.00
Dimension, 2x10, 16, No. 1, common	17.00	17.00
Timbers, 6x6 to 8x8, No. 1	20.00	20.00
Timbers, 3x12 to 12x12, rough	18.00	18.00

Portland cement prices manifest characteristic stability and as shown in the table below, which represents prices per barrel in carload lots, not including package, no changes from those given in the table of last month's issue are indicated.

New York	$2.15	Minneapolis	$2.32
Pittsburgh	2.09	Denver	2.85
New Orleans	2.30	Dallas	2.05
Chicago	2.10	San Francisco	2.31
Cincinnati	2.37	Montreal	1.15

Railway News Briefly Told

The new Board of Mediation created by the railway labor act has selected offices in the Earle building at Thirteenth and E. streets, N. W., Washington.

The Philadelphia Rapid Transit passenger air service is now operating between the Navy Yard at Philadelphia, Pa., and Hoover Field, Washington, D. C., a distance of 125 miles. The flying time is one hour and a half and the fare is $15 one way or $25 for a round-trip ticket good for 15 days.

The Colorado & Southern has asked the Colorado public utilities commission for permission to abandon all passenger service on its Georgetown Loop line between Denver, Colo., and Silver Plume, a distance of 49 miles, stating that because of the inroads of buses and privately owned automobiles it is impossible to operate trains without serious losses.

In making change for patrons in the purchase of tickets and in Baltimore & Ohio dining cars, ticket agents and stewards are giving out "Stone Mountain Memorial" half-dollars at their face value, as souvenirs. These special coins were purchased from the Stone Mountain Memorial Association at one dollar apiece by the Baltimore & Ohio for distribution among its patrons.

The Kansas City Southern has applied to the Interstate Commerce Commission for approval and authorization to acquire control of the Missouri-Kansas-Texas "by stock ownership not involving consolidation." A similar application by the Missouri-Kansas-Texas asks for authority to acquire control of the St. Louis Southwestern. If approved a new southwestern railroad system of 5,801 miles will be created.

The New Mexico & Arizona, a subsidiary of the Southern Pacific company, has been authorized by the Interstate Commerce Commission to abandon that portion of its line from a point immediately south of Benson, Ariz., to a point immediately north of Fairbank, 15.661 miles. It was shown on the record that this line is closely paralleled by a line of the El Paso & Southwestern recently leased by the Southern Pacific.

In Minneapolis, Minn., the city council's street traffic committee and representatives of six railroads approved plans, on August 12, for making 37 grade crossings in the city full stop crossings for all vehicular street traffic 24 hours a day. An ordinance will be prepared to embody all of the provisions of the state law requiring vehicles to stop at all railroad crossings, and in addition will authorize arrests and fines for violation of the ordinance.

The Illinois Central officially opened its electrified suburban service in Chicago on August 7, seven months ahead of the scheduled date of completion specified in the city ordinance. A pageant depicting the progress of transportation was presented before nearly 40,000 spectators in the stadium in Soldiers Field and the day's celebration closed with a banquet attended by more than 1,000 persons which was tendered to the officers of the railroad by the members of 116 civic organizations.

The automatic block signaling system of the Great Northern's main line is now complete from St. Paul, Minn., to Seattle, Wash., 1,794 miles, which the company asserts to be the longest unbroken installation of automatic signals on any railroad in the world. A train running from St. Paul to Seattle is operated under the block system every foot of the journey. Beginning with 1923, color-light signals have been installed, for use both day and night, and over one-third of the mileage mentioned consists of these signals.

Revenue freight car loading in the week ended August 4 totaled 1,109,557 cars, an increase of 26,358 cars over the preceding week, increases being shown in all commodities except grain and grain products, coke, merchandise and less-than-car-load freight. The total was 45,081 cars greater than for the corresponding week of last year and 156,149 cars more than for the same week in 1924. The cumulative total for the first 33 weeks of this year is 32,474,487, compared with 31,344,929 and 29,550,489 for the corresponding periods of 1925 and 1924, respectively.

The Boston & Maine is speeding up the work of enlarging its double track Hoosac tunnel which will increase the tunnel clearances by two feet and make possible the movement of the larger equipment which it has been necessary to detour around the tunnel in recent years at additional expense and inconvenience. This work on the Hoosac tunnel, which is approximately 25,000 ft. long, will involve the relaying of some 7,800 ft. of track and the excavation of approximately 11,500 cu. yd. of rock and other materials. The total cost of the work is estimated at $200,000.

A summary of changes in transportation rates and various items of expense in railroad operation was presented in the August Bulletin of the Atchison, Topeka & Santa Fe which shows the percentages of increases in these items in 1925 as compared with 1915. The increases were as follows: Freight rates, 52 per cent; passenger rates, 48 per cent; expenditures for fuel, 94 per cent; material, supplies and miscellaneous, 136 per cent; hourly compensation of employees, 135 per cent; annual compensation of employees, 98 per cent; labor, 131 per cent; cost of living, 69 per cent; total operating expenses, 124 per cent; taxes, 169 per cent; and investment in road and equipment, 35 per cent.

The transportation of the wheat crop in the southwest this year presented a difficult problem to the railroads due to its volume and also to the wide use of a new type of harvesting machine which cuts and threshes the wheat in one operation so that the grain is ready for shipment as soon as it has been cut, resulting in its reaching the railroads in greater volume during the harvesting season than under the old methods. The Atchison, Topeka & Santa Fe and the Chicago, Rock Island & Pacific, between June 16 and July 31, exceeded previous high records of loading by 84 and 57 per cent, respectively. Co-operation between the railroads and the regional shippers' boards resulted in moving the harvest without serious congestion or delays.

The Interstate Commerce Commission has denied, without prejudice to a resubmission, an application filed by a commission representing the state of North Carolina for a certificate authorizing the construction of a railroad from a point in the western part of North Carolina into the state of Tennessee to serve the so-called "lost provinces of North Carolina." Three alternate routes were proposed, involving the construction of from 91 to 109 miles, with estimated costs ranging from $7,430,000 to $9,470,000. The Interstate Commerce Commission found the evidence as to the cost of construction and the probable earnings inconclusive and unsatisfactory and also held that a single route, rather than alternate routes, should be presented for consideration.

Personal Mention

General

F. M. Hawthorne, division engineer on the Pennsylvania, with headquarters at Terre Haute, Ind., has been appointed acting superintendent of the St. Louis division, with the same headquarters, succeeding **Taber Hamilton,** who is on leave of absence.

R. V. Reamer, engineer maintenance of way of the Central of New Jersey, with headquarters at Jersey City, N. J., has been promoted to superintendent of the Lehigh & Susquehanna division, with headquarters at Mauch Chunk, Pa. Mr. Reamer was born November 10, 1881, at Lockport, N. Y., and entered railway service in 1901 as a chainman on the New York Central, being promoted to rodman in 1903. On March 13, 1906, he entered the service of the Central of New Jersey as a transitman and was promoted to assistant supervisor on August 26, 1909. On February 1, 1914, he was promoted to engineer maintenance of way in which capacity he was serving at the time of his recent promotion.

H. R. Gibson, division engineer on the Baltimore & Ohio, with headquarters at Connellsville, Pa., has been promoted to superintendent of the Newark division, with headquarters at Newark, Ohio. Mr. Gibson was born at Le Moyne, Ohio, on June 1, 1880, and was educated at the Ohio Northern University, where he graduated in 1905. He entered railway service in the same year as rodman on the Pennsylvania and in 1906 entered the service of the Baltimore & Ohio as a levelman at Cincinnati, Ohio, and was promoted to transitman on April 1 of the same year, with headquarters at Chillicothe, Ohio. On September 1, 1907, he was placed in charge of an engineering party at Cincinnati and in the spring of 1909 he was promoted to assistant division engineer, with headquarters at Chillicothe. On December 23, 1911, he was promoted to division engineer, with headquarters at Flora, Ill., being transferred to Seymour, Ind., on February 1, 1916. He was promoted to district engineer, with headquarters at Cincinnati, and on August 1, 1918, to assistant to the engineer maintenance of way of the Western Lines, with the same headquarters, and this was followed by his promotion to engineer maintenance of way of the Western Lines on September 1, 1918. He was made division engineer, with headquarters at Dayton, Ohio, on February 1, 1920, and was transferred to Connellsville, Pa., on January 1, 1921, in which capacity he was serving at the time of his recent promotion.

Engineering

L. P. O. Exley, chief engineer of the Gulf, Mobile & Northern, with headquarters at Mobile, Ala., has been appointed also chief engineer of the Jackson & Eastern, pursuant to the acquisition of control of the latter property by the former.

C. C. Williams, head of the civil engineering department of the University of Illinois and prior to 1922 professor of railway engineering at the University of Kansas, has been appointed dean of the College of Applied Science at the State University of Iowa, Iowa City, to succeed William G. Raymond, whose death was noted in the July issue.

A. Chinn, roadmaster on the Chicago, Burlington & Quincy, with headquarters at Kansas City, Mo., has been promoted to assistant engineer maintenance of way, with headquarters at Alliance, Neb., succeeding **T. P. O'Neill,** whose appointment as engineer maintenance of way on the Colorado & Southern is noted elsewhere in this issue.

S. L. Mapes, assistant engineer maintenance of way of the Central of New Jersey, with headquarters at Jersey City, N. J., has been promoted to engineer maintenance of way, with the same headquarters, succeeding **R. V. Reamer,** whose promotion to superintendent of the Lehigh & Susquehanna division is noted elsewhere in this issue.

M. A. H. Scull, supervisor, with headquarters at Ashley, Pa., has been promoted to assistant engineer maintenance of way, with headquarters at Jersey City, N. J., to succeed Mr. Mapes.

H. W. Brown, assistant engineer in the office of the chief engineer maintenance of way of the Western region of the Pennsylvania, has been promoted to acting division engineer of the St. Louis division, with headquarters at Terre Haute, Ind., succeeding **F. M. Hawthorne,** whose promotion to acting superintendent is noted elsewhere in this issue.

H. R. Clarke, general inspector of permanent way and structures of the Chicago, Burlington & Quincy, with headquarters at Chicago, has had his jurisdiction extended over the Colorado & Southern. **T. P. O'Neill,** assistant engineer maintenance of way of the Burlington, with headquarters at Alliance, Neb., has been appointed engineer maintenance of way of the Colorado & Southern, a newly created position, with headquarters at Denver, Colo.

J. R. Schick, engineer of branch lines on the Norfolk & Western, with headquarters at Roanoke, Va., has retired because of the age limit rule, and the position has been abolished. Other changes have been made in the engineering department as follows: **E. H. Roth,** crossing engineer, has been promoted to assistant engineer, with headquarters at Norfolk, Va., succeeding **J. W. Riatt,** who has been transferred to Bluefield, W. Va., where he succeeds **O. V. Parsons,** who has been transferred to the chief engineer's office at Norfolk, Va.

R. W. Gabriel, assistant division engineer on the Baltimore & Ohio, with headquarters at Washington, Ind., has been promoted to division engineer, with headquarters at Newark, Ohio, succeeding **A. R. Carver,** who has been transferred to Connellsville, Pa., in place of **H. R. Gibson,** whose promotion to superintendent, with headquarters at Newark, Ohio, is noted elsewhere in this issue. **J. H. Babbitt,** assistant on engineering corps at Garrett, Ind., has been promoted to assistant division engineer, with headquarters at Washington, Ind., succeeding Mr. Gabriel.

J. S. Robinson, for many years division engineer of the Galena division of the Chicago & North Western, with headquarters at Chicago, has retired and has been succeeded by **E. L. Mead,** division engineer on the Black Hills and Wyoming divisions, with headquarters at Chadron, Neb. **L. M. Bates,** assistant engineer on the Galena division, with headquarters at Chicago, has been promoted to division engineer of the Southern Illinois division, with headquarters at South Pekin, Ill., succeeding **C. H. Wells,** who has been transferred to Chadron, Neb., to succeed Mr. Mead.

H. C. Johnson, division engineer on the Pennsylvania, with headquarters at Cincinnati, Ohio, whose promotion to engineer maintenance of way on the Lake division, with headquarters at Cleveland, Ohio, was reported in the July issue, entered railway service as an assistant on an engineering corps on the Pennsylvania on July 16, 1901, serving in this capacity on various divisions until April 15, 1906, when he was promoted to assistant division engineer of the Michigan division. On June 1, 1908, he was promoted to division engineer of the Peoria division and on July 1, 1914, was transferred to the South Bend division. He was transferred to the Cincinnati division, with headquarters at Cincinnati, Ohio, on June 1, 1925, where he was serving at the time of his recent promotion.

H. E. Brink, whose promotion to general assistant engineer on the New York, New Haven & Hartford, with headquarters at New Haven, Conn., was noted in the August issue, was born on May 19, 1882, at Port Jarvis, N. Y., and entered the railway service as a rodman on the Erie on November 4, 1905, following which he was also inspector and transitman for the period of a year and served in a similar capacity on the New York Central for two years. He entered the service of the New York, New Haven & Hartford as a draftsman on September 10, 1908, after which he was successively promoted to resident engineer at Harlem River in June, 1912, assistant engineer with headquarters at New London, Conn., in March, 1916, and assistant

in office of construction engineer at New Haven, Conn., in June, 1917, in which capacity he was serving at the time of his recent promotion.

Track

J. W. Rementer, assistant supervisor on the Reading, with headquarters at Pottstown, Pa., has been appointed supervisor on the Central of New Jersey, with headquarters at Ashley, Pa., succeeding **M. A. H. Scull,** whose promotion to assistant engineer maintenance of way is noted elsewhere in this issue.

J. R. Walker, assistant roadmaster on the Chicago, Burlington & Quincy, with headquarters at Hannibal, Mo., has been promoted to roadmaster with headquarters at Kansas City, Mo., succeeding **A. Chinn,** whose promotion to assistant engineer maintenance of way, with headquarters at Alliance, Neb., is noted elsewhere in this issue.

A. M. Bean, district roadmaster on the Butte division of the Great Northern, with headquarters at Judith Gap, Mont., who has been on a leave of absence, as reported in the August issue, has resumed his duties, and **Calvin Hankins,** who was appointed roadmaster in his place during his absence, has been assigned to other duties. **Martin Williams** has been appointed district roadmaster on the Willmar division, succeeding **C. Raiter,** who has been assigned to other duties.

Henley Bell, assistant engineer in office of the division engineer maintenance of way of the New York Central, Ohio Central Lines, with headquarters at Charleston, W. Va., whose promotion to supervisor, with headquarters at Hobson, Ohio, was reported in the August issue, was born at Richmond, Ind., and entered railway service as a rodman on the Cincinnati, Hamilton & Dayton (now a part of the Baltimore & Ohio), and subsequently was employed by the Chesapeake & Ohio in both the construction and store departments. He was later engaged in construction in the development of various coal properties in West Virgina and served as resident engineer during the construction of the Coal River Collieries plant at Ashford, W. Va. On the completion of this work, he entered the service of the New York Central as a transitman in the office of the division engineer maintenance of way, where he was located at the time of his recent promotion.

J. H. Blackburn, whose appointment as supervisor on the Gulf & Ship Island lines of the Illinois Central, with headquarters at Mendenhall, Miss., was reported in the July issue, was born on November 3, 1885, at Fulton, Ky. and entered railway service as a laborer in an extra gang on the Illinois Central on January 1, 1905, remaining with the company as laborer and assistant foreman until December 1, 1906, when he entered the service of the W. J. Oliver Construction Company as track and dump foreman, remaining in that position until October 27, 1909, when he re-entered the service of the Illinois Central as section foreman at Jackson, Tenn., from which place he was transferred to Waterford, Miss., on August 10, 1909. He resigned this position on October 27, 1913, and on February 26, 1914, again entered the employ of the Illinois Central as section foreman at Granada, Miss., which position he was holding at the time of his recent promotion.

Joseph Scharlman, whose promotion to roadmaster on the Los Angeles & Salt Lake unit of the Union Pacific, with headquarters at Las Vegas, Nev., was noted in the August issue, was born on April 4, 1886, at Steinfeld, Oldenburg, Germany, and entered railway service in 1905 as a section laborer on the Chicago & Northwestern at Jefferson Park, Ill. In 1906 he served as a pile driver operator on the Southern Pacific and in 1907 was pile driver foreman for the Merserou Bridge Company. In 1910 he entered the service of the Los Angeles & Salt Lake as a bridge and building carpenter on the reconstruction of that road following the extensive floods of that year. In 1911 he was a pile driver operator on the Pacific Electric and in 1913 was a pile driver foreman for the Harbor Department of the city of Los Angeles, Cal. In 1914 he returned to the service of the Los Angeles & Salt Lake as a bridge and building carpenter, being promoted to section foreman, with headquarters at Hitt, Nev., serving in that capacity and as extra gang foreman until his recent promotion.

C. F. Ogden, whose promotion to roadmaster on the Chicago, Milwaukee & St. Paul, with headquarters at Horicon, Wis., was reported in the July issue, was born on Sept. 7, 1887, at DeKalb, Mo. He entered railway service as a section laborer at Rock Valley, Iowa, on the Chicago, Milwaukee & St. Paul in March, 1913, and was promoted to section foreman in February, 1915. He was transferred to Lennox, S. D., in January, 1916, and served continuously since that time as section and extra gang foreman, and assistant and acting roadmaster, between Mason City, Iowa, and Chamberlain, S. D., with the exception of two months this year when he was in charge of a rail laying gang on the Aberdeen (S. D.) division, which position he was holding at the time of his recent promotion.

R. W. Putnam, whose promotion to roadmaster on the Southern Pacific, with headquarters at Eugene, Ore., was reported in the July issue, graduated from Colorado College at Colorado Springs, Colo., in 1912, and entered railway service as an axeman on a survey party on the Southern Pacific in Oregon in the same year. After acting as axeman and rodman for four months he was promoted to instrument man, in which capacity he served for four years, being transferred to California in 1916. In the same year he was transferred to maintenance of way department on the San Joaquin Valley division, with headquarters at Bakersfield, Cal., and was promoted to assistant engineer later in 1916. In 1918 he was transferred to the Portland division, with headquarters at Portland, Oregon. In the spring of 1925, Mr. Putnam was made assistant engineer in charge of the construction of a new terminal.

Changes on the Southern

W. B. Marshall, track supervisor on the Southern, with headquarters at Greensboro, N. C., has been promoted to roadmaster, with headquarters at Lexington, Ky., an additional roadmaster's office having been created with jurisdiction over the lines of the Cincinnati, New Orleans & Texas Pacific, north of Danville, Ky., on account of the heavy maintenance program on this territory. The supervisor's territories have also been shortened and an additional supervisor has been put on, **J. G. Woodall,** track supervisor on the Atlanta division, with headquarters at Rome, Ga., having been transferred to this position, with headquarters at Ludlow, Ky. **C. F. Echols** has been appointed assistant track supervisor, with headquarters at Rome, Ga., to succeed Mr. Woodall. **W. C. Morris,** assistant engineer maintenance, with headquarters at St. Louis, Mo., has been promoted to track supervisor on the Western district, with headquarters at Lawrenceburg, Ky., succeeding **C. Patterson,** who has been assigned to other duties on account of ill health. **B. Correll,** track supervisor on the Alabama & Great Southern, who has been off duty for about a year on account of injuries, has resumed his duties, succeeding **C. E. Price,** who has been transferred to Tuscaloosa, Ala., where he takes the place of **S. B. Hinton,** who has been assigned to other duties. **S. E. Sims,** roadmaster on the Mobile division, with headquarters at Selma, Ala., has been transferred to the Birmingham division, with headquarters at Birmingham, Ala., where he succeeds **N. H. Self,** who has been transferred to the Northern Alabama, with headquarters at Sheffield, Ala., succeeding **J. H. Waters,** who in turn has been transferred to the Birmingham division, with headquarters at Selma, Ala.

Bridges and Buildings

E. H. Nutt has been appointed supervisor of bridges and buildings on the newly created roadmaster's territory on the Cincinnati, New Orleans & Texas Pacific lines of the Southern, with headquarters at Lexington, Ky.

Purchasing and Stores

C. E. Swanson has been appointed storekeeper of the Chicago, Burlington & Quincy, with headquarters at Plattsmouth, Neb., succeeding **W. F. Huneke,** who has been assigned to other duties.

Construction News

The Atchison, Topeka & Santa Fe has received bids covering the construction of a two-story laboratory building, 200 ft. by 26 ft., at Argentine, Kan., which is estimated to cost $70,000. Bids are also being received for a locomotive tender washing plant at Topeka, Kan., to cost approximately $25,000. The Interstate Commerce Commission has authorized the Corona & Santa Fe, to be controlled by lease and stock ownership by the Atchison, Topeka & Santa Fe, to construct a line from Alberhill, Cal., to Porphyry, a distance of approximately 15 miles. The line is estimated to cost $981,704.

The Atlantic Coast Line has awarded a contract to the Roberts & Schaefer Company, Chicago, for two electric cinder handling plants to be installed at High Springs, Fla., and Lakeland.

The Central of New Jersey has awarded a contract to Arthur E. Smith, Plainfield, N. J., for the construction of concrete abutments and a reinforced concrete deck of a new bridge at Martine avenue, Fanwood, N. J., to cost approximately $26,180.

The Canadian National has awarded a contract to the E. J. Ryan Construction Company, Vancouver, B. C., for the construction of a 12-story hotel containing 512 rooms in Vancouver, B. C., estimated to cost $4,000,000.

The Canadian Pacific has awarded a contract to Carter, Halls, Aldinger & Co., of Winnipeg, Man., for the construction of an addition to the Canadian Pacific hotel at Banff, Alta.

The Chicago & Eastern Illinois has awarded a contract to G. A. Johnson & Son, Chicago, for the construction of an engine terminal at Evansville, Ind.

The Chicago & North Western is receiving bids for the construction of a power plant, 60 ft. by 35 ft., at Antigo, Wis.; for an eight-stall brick roundhouse at Watersmeet, Mich., and for eight car repair shop buildings at Proviso, Ill.

The Chicago & Western Indiana is constructing an extensive layout of team tracks at Twenty-sixth and Canal streets, Chicago, to cost approximately $1,500,000.

The Chicago, Milwaukee & St. Paul has been authorized by the Federal Court at Chicago to make expenditures for the following construction work: Extension of passing tracks and new passing tracks, $28,000; bridge work at various points, $148,000; water stations and treating plants at Channing, Mich., Hawarden, Ia., Bird Island, Minn., Bowdle, S. D., and Summit, Ia., $77,000; mechanical coaling station at South Beloit, Ill, $28,000; electrification of yards at Harlowton, Mont., and Avery, Idaho, $25,000; and improvements at Milwaukee stockyards, $40,000.

The Chicago, Rock Island & Pacific has awarded a contract to the Roberts & Schaefer Company, Chicago, for three electric cinder handling plants to be installed at Valley Junction, Iowa. Plans have been prepared for the construction of an extensive yard layout at Joliet, Ill., which is estimated to cost $250,000.

The Chicago, St. Paul, Minneapolis & Omaha has awarded a contract to T. & L. B. Libby, Minneapolis, Minn., for the construction of an addition to the enginehouse at St. James, Minn., at an estimated cost of $50,000.

The Cisco & Northeastern has applied to the Interstate Commerce Commission for authority to extend its line from Breckenridge, Tex., to Throckmorton, approximately 40 miles.

The Cleveland, Cincinnati, Chicago & St. Louis has awarded a contract to the McClintic-Marshall Company, Pittsburgh, for the erection of several bridges of a total weight of 1,100 tons at various locations.

The Denver & Salt Lake has awarded a contract to E. H. Honnen, Colorado Springs, Colo., for the construction of two miles of railway from the west portal of the Moffat tunnel to connect with the Denver & Salt Lake line.

The Elgin, Joliet & Eastern is receiving bids for the construction of a one-story brick car department shop building to have dimensions of 354 ft. by 42 ft., and to be located at East Joliet, Ill.

The Florida East Coast has awarded a contract to the Stevenson Engineering & Contracting Company, St. Augustine, Fla., for the construction of an inter-track fence, station platform, waiting booth and plank crossing over tracks situated between Jacksonville and New Smyrna, Fla., and between Salerno and Miami, Fla. The estiamted cost is $55,000. A contract has been awarded to Royce Kershaw, Inc., St. Augustine, Fla., for a similar inter-track fence, platform, booth and crossing between Indian River City and Port Sewell, Fla., to cost approximately $65,000.

The Great Northern has begun the construction of the first unit of a 250-room hotel at Watertown Lake, B. C., north of Glacier Park. The construction of a freight terminal at the south end of Lake Union, Seattle, Wash., at a cost of approximately $750,000, has been authorized, as has also the construction of a freight station at Seattle, Wash., to cost approximately $750,000.

The Gulf, Mobile & Northern plans the reconstruction of the Jackson & Eastern between Union, Miss., and Lena and an extension from Lena to Jackson, Miss., which will involve the construction of a bridge across the Pearl river at Jackson.

The Illinois Central has received bids for the construction of a water station at West Frankfort Junction, Ill., at an estimated cost of $30,000, and bids for the construction of a subway at Bloomington, Ill., which is estimated to cost approximately $150,000.

This company has awarded a contract to the Railroad Water & Coal Handling Company for the construction of a 600-ton demountable steel coaling station at 27th St., Chicago.

The Kansas City Southern has closed bids for the construction of a brick passenger station at Gentry, Ark., which is estimated to cost $20,000.

The Long Island, in an advertisement addressed to its patrons, definitely commits itself to the construction of a new suburban terminal at Diagonal street, Long Island City, in the event that an agreement can be reached with the city authorities.

The Minneapolis, Northfield & Southern has awarded a contract to Nolan Brothers, Minneapolis, Minn., for the construction of a six-mile extension from Luce Line Junction, Minn., to Robbinsdale, estimated to cost $225,000.

This road contemplates six grade crossing separations along a six mile extension from Golden Valley, Minn., to Crystal and has submitted the plans to the Hennepin County Commissioners for approval.

The Missouri-Kansas-Texas is reported to have announced that the construction of an extension from San Antonio, Tex., to the Texas-Mexican border, a distance of more than 100 miles, is contemplated. A contract has been awarded to the Roberts & Schaefer Company, Chicago, for the construction of a 600-ton, three-track, reinforced concrete, automatic electric coaling station at Denison, Tex., and for the construction of a 200-ton station of the same type at Bartlesville, Okla.

The Missouri Pacific has awarded a contract to S. M. Bates & Co., Kansas City, Mo., for the construction of a station at Corning, Ark.

Bids have been received for the construction of a two-story brick and concrete freight station, 40 ft. by 250 ft., at Coffeyville, Kan. It is reported that bids will be received early next year for the construction of a union passenger station at Texarkana, Ark., to be built and used jointly by the Missouri Pacific, the Texas & Pacific, the St. Louis-Southwestern and the Kansas City Southern. The cost of the structure, in accordance with plans now being prepared, is estimated at approximately $1,300,000. A contract has been awarded to the Woods Brothers Construction Company, Lincoln, Neb., for the construction of a 2,500-ft. reinforced concrete and steel bridge over the Platte river at LaPlatte, Neb., estimated to cost $250,000. Negotiations for the purchase of real estate upon which to erect the new

general office building at St. Louis, Mo., have been completed, and plans for it have been prepared. The structure will be 17 stories in height and will cost approximately $2,000,000. It will front on Olive, Pine and 13th streets, in St. Louis. The office building will be a feature of the proposed Memorial Plaza and its architecture will harmonize with the public and other buildings to be erected in connection with the city's building program on this site. With the exception of the first floor, which is to be leased for shops and stores, the entire building will be used by the railway. Plans are being prepared for the construction of a repair and machine shop at Poplar Bluff, Mo.

This road and the Chicago, Rock Island & Pacific will share in the cost of a viaduct to be built at North Little Rock, Ark., to carry Main Street over the tracks of these companies. The viaduct will be 1,857 ft. long, of reinforced concrete and the estimated cost is $305,997.

The New Orleans Great Northern has applied to the Interstate Commerce Commission for authority to build an extension from Nogan, Miss., through the city of Jackson, Miss., to the west bank of the Pearl river, to connect with the line of the Jackson & Eastern now under construction to that point.

The New York Central has awarded contracts for new work as follows: To the Frederick Snare Corporation, New York, for the erection and painting of the superstructure of a viaduct from St. Clair place to West 137th street, New York, at an estimated cost of $235,000; to Fred T. Ley & Co., Inc., New York, for the construction of duct lines and splicing chambers, Riverdale, N. Y., to Ludlow, at an estimated cost of $165,000; to the Thomas Crimmins Contracting Company, New York, for the elimination of a grade crossing at Mosholu avenue, New York, at an estimated cost of $70,000; to the Mohawk Dredge & Dock Company for the construction of septic tanks, sand filters, sludge beds and grease traps at Selkirk, N. Y., at an estimated cost of $5,000; and to the Bates & Rogers Company, Chicago, for the reconstruction of a bridge at Genesee Junction, N. Y., at an estimated cost of $40,000, and for the construction of two viaducts over Grand boulevard, Miller, Ind., the latter contract being for the masonry work, all preliminary work having been completed by the railway.

The New York, New Haven & Hartford has awarded contracts as follows: To H. R. Kent & Co., Rutherford, N. J., for engine terminal improvements at New Bedford, Mass., at an estimated cost of $125,000; to the McNally Construction Company, Fall River, Mass., for engine terminal improvements at Fall River, Mass., at an estimated cost of $95,000; to the Tredennick-Billings Company, Boston, Mass., for engine terminal improvements at Lowell, Mass., at an estimated cost of $80,000; to the Roberts & Schaefer Company, Chicago, for the construction of a coal pocket at Midway, Conn., at an estimated cost of $50,000, and for coal and cinder plants at Lowell, Mass., and Fall River, estimated to cost $30,000 and $34,000, respectively; and to the Truscon Steel Company for metal buildings at New Haven, Conn., and East Hartford, estimated to cost $30,000 and $40,000, respectively.

The Norfolk & Western has awarded a contract to the Virginia Bridge & Iron Co., Roanoke, Va., for overhead bridge work, involving a total expenditure estimated at $35,000. This company has awarded a contract to J. P. Pettyjohn & Co., Lynchburg, Va., for the construction of a roundhouse and machine shop at Williamson, W. Va., to cost approximately $115,000.

The Northern Pacific has awarded a contract to E. J. Dunningan, St. Paul, Minn., for the construction of a freight station at St. Paul, to cost approximately $400,000.

The Pennsylvania has awarded contracts as follows: To M. J. McMenamin, Philadelphia, Pa., for masonry in connection with the reconstruction of a bridge over Pine creek at Clairton, Pa., at an estimated cost of $25,000; to the Seaboard Construction Company, Philadelphia, Pa., for the construction of five overhead bridges in connection with second track work between Pierron, Ill., and St. Jacob, and between Casey, Ill., and Montrose, at an estimated cost of $37,000; to the Hodges Construction Company, Cincinnati, for the construction of a viaduct at Red Bank, Ohio, at an estimated cost of $65,000; to the John F. Casey Company, Pittsburgh, Pa., for masonry work in connection with grade crossing elimination at Manor, Pa., at an estimated cost of $230,000; and to the Roberts & Schaefer Company, Chicago, for the construction of a 650-ton reinforced concrete coaling station at Ft. Wayne, Ind. Contracts have been awarded to the W. F. Trimble & Sons Company, Pittsburgh, Pa., for the foundations for new shop buildings at Shire Oaks, Pa., at an estimated cost of $31,000, and for masonry for three subways in Sewickley, Pa., and two subways in Edgeworth, Pa., in connection with a line change from Glen Osborne, Pa., to Shields, at an estimated cost of $110,000. A contract has been awarded to the Stevens Construction Company, Cleveland, Ohio, for grading and masonry for grade separation at Akron, Ohio, jointly with the city, the Baltimore & Ohio and the Erie, at an estimated cost of $220,000. Plans are being prepared for the construction of a passenger station at Gary, Ind., at an estimated cost of $100,000.

The Seaboard Air Line has awarded a contract to the Roberts & Schaefer Co., Chicago, for the construction of a 200-ton, reinforced concrete coaling station with sanding facilities at Indiantown, Fla. A contract for additional shop facilities and buildings at Indiantown, Fla., has been awarded to the Elliott Building Company, Hickory, N. C. Sutton Brothers, Jacksonville, Fla., have the contract for yard and shop track construction at the same point.

The Southern, through its subsidiary, the Cincinnati, New Orleans & Texas Pacific, has awarded a contract to the Virginia Bridge & Iron Co., Roanoke, Va., for the construction of a highway truss bridge to cost approximately $130,700.

The Southern Pacific has prepared plans for the construction of shop and terminal buildings at Klamath Falls, Ore., which are estimated to cost $325,000. A contract has been awarded to the W. J. Harris Contracting Company, El Paso, Texas, for the construction of the extension from Edinburg, Texas, to Falfurrias, a distance of approximately 50 miles.

This road has submitted plans to the California Railroad Commission for a union station at Los Angeles to be used jointly by the Southern Pacific, the Atchison, Topeka & Santa Fe and the Union Pacific. The total cost of the project is estimated at $14,934,000 and includes $2,071,000 for the station, $370,000 for umbrella sheds and $7,943,000 for the necessary lands and improvements.

The Wabash has awarded a contract to Jerome Moss, Chicago, for the construction of a transfer house at Forty-seventh street, Chicago, to cost $60,000. Bids are being received for the construction of a three-story brick and concrete office building, 160 ft. by 68 ft., and a reclamation building at Decatur, Ill.

The Warrior River Terminal, which has recently been authorized by the Interstate Commerce Commission to acquire a line from Ensley Junction, Ala. (near Birmingham), to Birmingport on the Warrior river, has now received authority to construct 0.13 miles of line and acquire trackage rights over the Birmingham Southern to give it a new mileage of 3.58.

The Western Pacific has prepared plans for the construction of an icing plant at Marysville, Cal., which is estimated to cost approximately $50,000.

Equipment and Supplies

The Canadian Pacific has ordered 25,000 tons of rails from the British Empire Steel Company of Sydney, N. S.

The Southern Railway has ordered 17,000 tons of rails from the Tennessee Coal, Iron & Railroad Company.

The Atlantic Coast Line has ordered 32,000 tons of rails from the Tennessee Coal, Iron & Railroad Company.

The Chicago & North Western has ordered one 30-ton locomotive crane from the American Hoist & Derrick Company.

The Colorado & Southern has ordered one steam shovel with crawler treads from the American Hoist & Derrick Company.

Supply Trade News

General

The Sullivan Machinery Company has moved its Boston, Mass., office from 201 Devonshire street to 45 Milk street.

The American Steel Foundries has moved its St. Louis office from the Frisco building to the Railway Exchange building.

The Timken Roller Bearing Company will construct an extension to its plant at Canton, Ohio, at an estimated cost of $1,000,000.

The Bethlehem Steel Company has bought an electric cinder plant for installation at Sparrows Point, Md., from the Roberts & Schaefer Company.

The Marion General Excavator Company, Marion, Ohio, has been organized to engage in the manufacture of light caterpillar crane and shovel dragline combinations and small excavating machines.

The San Francisco office of the **Massey Concrete Products Corporation,** Chicago, has been consolidated with the Los Angeles office, located in the Pacific Electric building at Los Angeles, where **F. V. Shannon,** western manager, will make his headquarters.

The Roberts & Schaefer Company, Chicago, has extended its general office facilities and is now occupying the entire eleventh floor in the Wrigley building. The additional facilities were required because of a 57 per cent increase in business during the first seven months of this year, as compared with the same period last year.

The McMyler-Interstate Company has appointed the W. H. Worden company of San Francisco, Cal., its distributor for the states of California, Arizona and Nevada, and **C. F. Wolfradt,** formerly Pacific Coast branch manager of the McMyler Interstate Company has become affiliated with the Worden Company. The Hofius Steel & Equipment company, Seattle, Wash., has been appointed distributor for the states of Washington, Oregon and Idaho. **Thurman G. Frazee** has been appointed representative with headquarters in the First National Bank Bldg., Houston, Texas.

The Pyrotung Manufacturing Company has recently been organized and a new plant built at 730 W. 50th street, Chicago, for the manufacture of railroad track drills and shop cutting tools. These tools are made by the new Pyrotung process, designed to give unusual toughness and hardness without brittle. The officers of the new company are: W. R. Otis, president; C. E. Sutten, vice-president; B. C. Cleveland, vice-president and metallurgical engineer; and C. E. Pynchon, general manager, formerly manager of the machinery and tool departments of J. T. Ryerson & Son, Inc.

Personal

William Lawton Manson, for many years New England agent at Boston, Mass., of the American Hoist & Derrick Company, St. Paul, Minn., died in Boston on August 7, at the age of 73.

H. G. Steinbrenner has been elected second vice-president of the Brown Hoisting Machinery Company, Cleveland, Ohio, and will have charge of the marketing of the company's products.

Frederick Sherwood Kretsinger, Evanston, Ill., chairman of the board of the American Fork & Hoe Co., Cleveland, Ohio, died on August 22 at Cleveland from a heart attack. He organized the company in 1900, and retired as president in 1906, since then serving as chairman of the board.

Arthur H. Weston has been appointed representative of the Clark Car Company, Pittsburgh, Pa., with headquarters in the American National Bank Building, Richmond, Va., handling that company's business in the states of Maryland, Virginia, North Carolina and South Carolina. Mr. Weston was formerly sales engineer for the Symington Company and more recently was vice-president of the Car Devices Company.

Harry W. Schott, assistant general sales manager of the National Carbon Company, Inc., has been promoted to general sales manager. Mr. Schott has been identified with the electrical industry, in both the jobbing and manufacturing ends of the business for almost 25 years. In 1913, he went with the American Eveready Works; he then served in the Canadian territory for the American Eveready Works, whose Canadian branch was established in 1914, and when that branch was taken over by the Canadian National Carbon Company in 1918 he was appointed assistant sales manager. In 1920 he returned to New York as eastern sales manager of the American Eveready Works, and in 1921 when it was absorbed by the National Carbon Company he became the eastern district manager for the latter concern. He was appointed assistant general sales manager of the National Carbon Company in 1924, and continued in that capacity until his recent promotion.

William H. Elliott, vice-president and a director of the Ramapo Ajax Corporation, Hillburn, N. Y., and former president of the Elliott Frog & Switch Company of East St. Louis, Ill., died on August 8 at the Green Bay, Wis., hospital at the age of 62. He was born in Nashville, Tenn., and was educated at the Kemper Military Academy at Boonville, Mo. His entire business career was spent with the Elliott Frog & Switch Company, which was started by his father, Henry Elliott, Sr., with his brother, George Elliott, in 1874. He became president of the company in September, 1921, on the death of his cousin, Henry Elliott, Jr., and in October, 1924, when the company was taken over by the Ramapo Ajax Corporation he was elected vice-president and director in full charge of the East St. Louis plant.

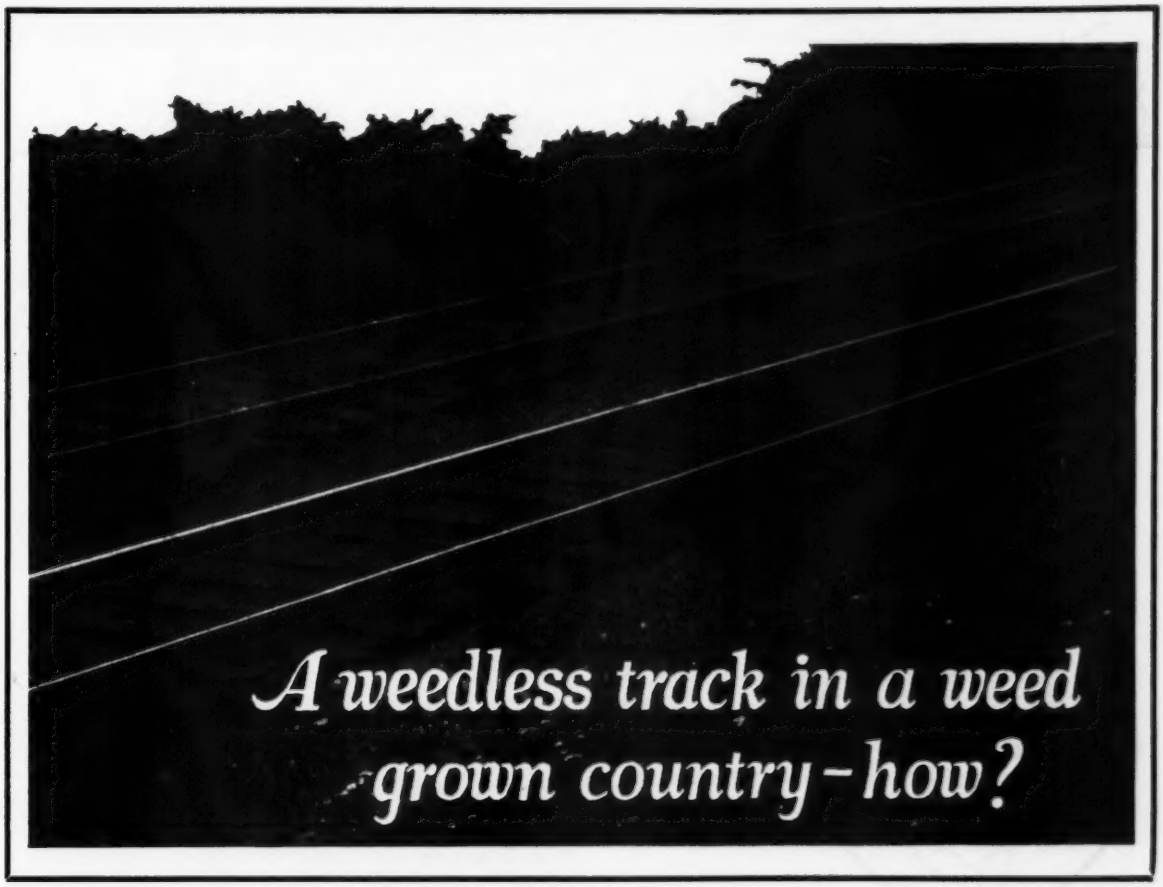
William H. Elliott

Trade Publications

Railroad Sand Drying Equipment.—The Roberts & Schaefer Company, Chicago, has issued a 12-page bulletin which describes its various equipments for drying and handling locomotive sand, ranging from the simple stove driers to the automatic devices which eliminate practically all labor. The bulletin is copiously illustrated with views and plans showing the construction of the different devices.

Fairmont 21.—A circular with this title has been issued by Fairmont Railway Motors, Inc., which tabulates 21 paragraphs on the advantage of the Fairmont endless cord belt drive. In addition, the circular contains illustrations and brief descriptive data of the M19 center load inspection car, and the A2, S2, M2 and M14 section cars manufactured by that company.

Sullivan Air Lift Pumping Methods and Equipment.—The Sullivan Machinery Company, Chicago, has issued Bulletin No. 71-I, a booklet of 48 pages, describing its air lift pumping equipment and setting forth the advantages of this method of pumping water, together with instructions for securing well data and estimating on air lift installations. The method of "back blowing" to increase the flow of water through the strainer is described in detail as well as this company's method of constructing wells by means of which gravel is substituted for sand around the intake pipe in the water bearing strata.



DENSE growth of the most resistive variety of weeds quickly and completely yields to the positive killing power of Atlas Non-Poisonous Weedkiller.

Applied under the Atlas Service contract, any track in any location can be thoroughly cleared of all vegetation for at least a full year.

The efficiency of Atlas Service in judging the proper chemical and applying it without waste, offers the most satisfactory and economical method of present day weed killing.

ATLAS
NON-POISONOUS WEED KILLING
SERVICE

CHIPMAN CHEMICAL ENGINEERING CO., INC.

Sole Licensee for Non-poisonous Weedkiller Under United States Patent No. 1,534,289

Executive Office: BOUND BROOK, NEW JERSEY

Bound Brook, N. J. Palo Alto, Cal. Houston, Tex.

MAKERS OF POWDERS SINCE 1802

Careful preparation ensures complete detonation

"FOR want of a nail the shoe was lost; for want of a shoe the horse was lost; and for want of a horse the rider was lost."

Everyone who has anything to do with blasting work thoroughly appreciates this way of Benjamin Franklin's saying, "Perfection is the sum of many details." Production of materials, efficient work, progress and prevention of accidents are dependent upon the reliability of such an agent as a blasting cap.

Yet the actual cost of reliable blasting accessories is relatively so trifling that it is obviously wasteful to compromise with anything less than the accessories made by du Pont, thoroughly dependable for three very logical reasons:

FIRST: **Du Pont Blasting Accessories are the products of the oldest explosives manufacturer in the country —125 years of explosives experience.**

SECOND: **Right because made in the most complete explosives plants in the world; rigidly inspected at every step of manufacture, and their performance practically observed in the field.**

THIRD: **That no other accessories perform more efficiently is demonstrated by the increasing demand for du Pont Blasting Accessories.**

Don't temporize! The most economical way is the sure way — insist on the use of du Pont Blasting Accessories.

Send for catalog giving practical data relating to selection and use of du Pont Blasting Accessories.

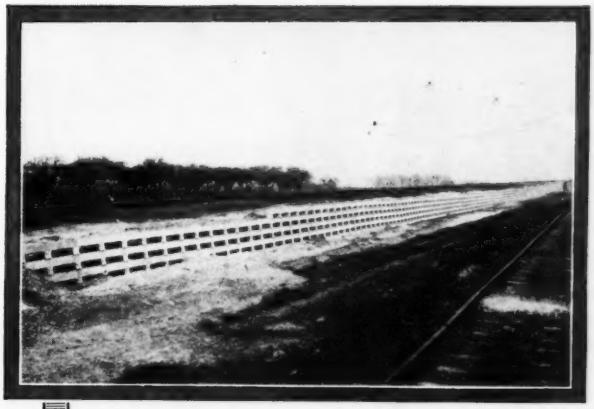
E. I. DU PONT DE NEMOURS & CO., Inc.
Explosives Department
WILMINGTON, DELAWARE

DU PONT

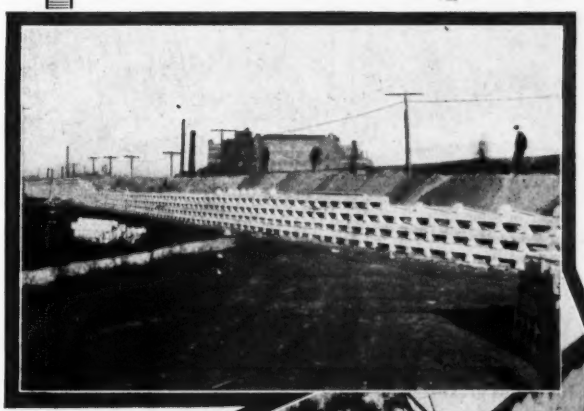
Blasting Accessories

125 YEARS OF LEADERSHIP IN THE SERVICE OF INDUSTRY

Reinforced CONCRETE CRIBBING BEAMS



100% Adaptable to Your Class of Work



SLASH 50% from the cost of your **retaining walls** with R. C. Precast Automatic-Interlocking-Flexible Concrete "I" Beams. Let common laborers pile them up and fill in behind them immediately. There will be no waiting till the wall "sets," no forms to build with expensive labor, no costly delays of any kind.

R. C. Reinforced Concrete Beams are economical for permanent walls. Or, if you want to, you can use them over and over again on temporary work. They will always be 100% salvageable. Even after years of permanent service they can be torn up and used again.

We make these beams in our plant and ship them to you. Let us tell you more about them. Write for detailed information.

The R. C. Products Company, Inc.

Engineers Bldg., Cleveland, Ohio

New York Indianapolis Norfolk San Francisco Chicago

A Mouthful at Every Bite

Guarantee
Owen Buckets, properly installed and operated, are guaranteed to do a bigger day's work than any other bucket of the same weight and capacity—
—or—
Write your own guarantee!
THE OWEN BUCKET CO.

DON'T mistake the closing power of a bucket for digging power. Because digging power cannot be obtained so easily—instead, it is a problem of combining and governing scientifically the factors of (1) closing power and (2) weight.

The tremendous closing power of an Owen Bucket is supplied by a block and tackle principle, especially designed. Yet alone, this great force is without real ability—weight, but not bulky weight, must be added. This weight is distributed in an Owen. The greater part of it is concentrated at the main shaft to hold the bucket stationary and to counteract the upward pull as the closing power is applied. In this way balance is gained, and the bucket is prevented from tipping and scrapping over the material.

Held as though it were actually anchored to the ground and the jaws brought together steadily and surely, an Owen Bucket is like the fierce jungle leopard when it comes to getting A Mouthful At Every Bite.

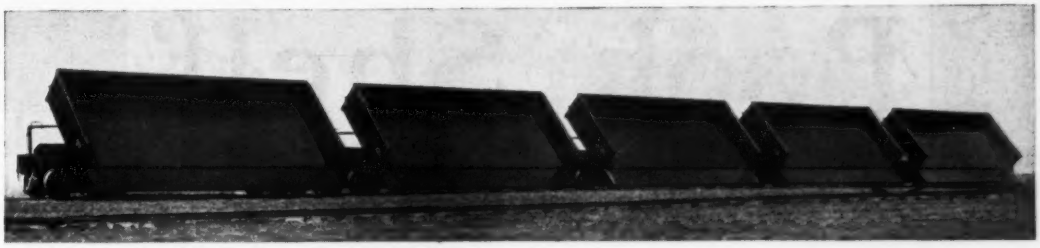
Owen recommendations are more than descriptive data about buckets—they are about bucket JOBS. Let us tell you how one of the seven Owens will do your work. No obligation at all.

The OWEN BUCKET Co.
ROCKEFELLER BLDG.
CLEVELAND, OHIO

BALTIMORE CHICAGO DALLAS DETROIT LOS ANGELES MINNEAPOLIS PHILADELPHIA
PITTSBURGH NEW YORK MIAMI PORTLAND ST. LOUIS SAN FRANCISCO TAMPA

OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAYS WORK

Owen Buckets



A clean floor—Steep dumping angle—No obstruction to discharge of load.

DIFFERENTIAL *Double Fulcrum* AIR DUMP CARS

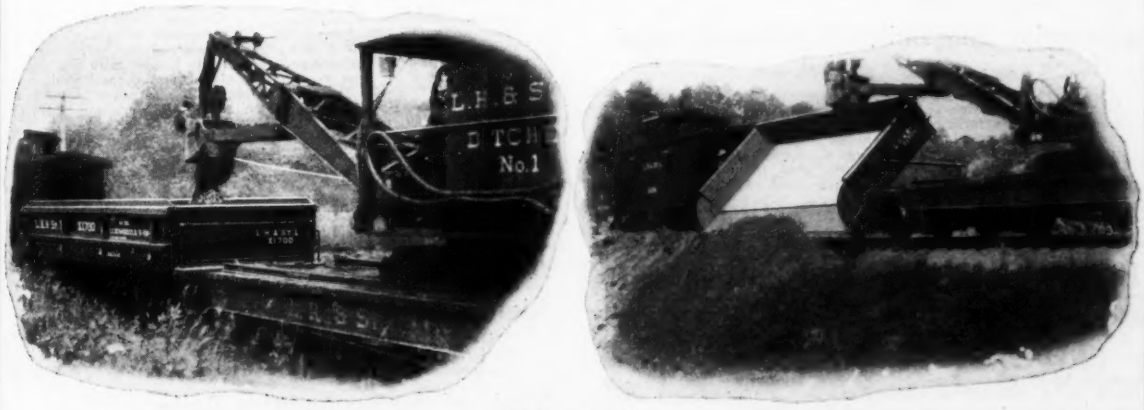
IN DITCHING OR STEAM SHOVEL SERVICE

Save Labor Because

1. They are lower and load more quickly and easily. They can be loaded to capacity by standard Ditcher.
2. They dump quickly in either direction with no labor, other than turning lever.
3. They do not foul the ballast. The dump body not only revolves about a point over the gage line to get extra dumping distance from the track but the door folds down forming a chute which casts the material still further away.
4. The floor is smooth and the dumping angle is steep giving clean dumping action.
5. There is no locking mechanism to give trouble —absolutely no danger of accidental dumping.
6. Their superiority of design and construction practically eliminates loss of time due to break downs and repairs.
7. The cars are stable. Instead of being pivoted along center line, the body rests on four points directly over the bolster side bearings.
8. The cars dump quickly and easily. There is no shock or kick-back to damage trestles, throw track out of line or to damage car itself.

Differential Air Dump Cars Are Safe

They can be hauled in revenue trains at high speeds without danger. There is no swaying or rocking to the body to cause derailment or spillage of lading.



Patents Pending

THE DIFFERENTIAL STEEL CAR CO.

FINDLAY, OHIO

Simmons-Boardman Publishing Company's Book Shelf

Car Builders' Cyclopedia

Edited by Roy V. Wright and R. C. Augur under the auspices of the American Railway Association, Division V, Mechanical. The standard authority on car construction, covering all modern types, with description and illustration of the various parts. 1157 pages size 9 x 12 inches, 2848 illustrations. 1925 edition. Cloth, $8. Leather, $10.

Locomotive Cyclopedia

Compiled by the same editors and under the same auspices as "Car Builders' Cyclopedia," and covering its own field with equal thoroughness. The 1925 edition, revised and improved. 1115 pages, 2588 illustrations. 9 x 12 inches. Cloth, $8. Leather, $10.

Railway Engineering and Maintenance Cyclopedia

Edited by E. T. Howson—W. F. Rench, Neal D. Howard and F. M. Patterson in co-operation with the A. R. E. A. and the Signal Section of A. R. A. Sections cover Track, Bridges and Buildings, Signaling, Water Service and Wood Preservation, with a general section and one on catalog data. Over 1,000 pages, 9 x 12. Regular price, Cloth, $8; Leather, $10. 1926 edition.

Air Brake Inspector's Handbook

Carl O. Glenn. Air brake inspectors, freight and passenger car inspectors, and enginemen will find all types of disorders described. 181 pages, 42 illustrations, cloth. 5 x 7¼ inches. $2.00.

Air Brake Manual for Locomotive Engineers

F. L. Jones. Handling of brakes and road repair plainly treated, in a pocket-size book, illustrated, bound in flexible imitation leather. Two charts showing Westinghouse A-1 and E-T No. 6 brake equipment free with the book. 197 pages, 4½ x 6¾. $2.25.

Analysis of Railroad Operations

J. L. White, formerly assistant comptroller, U.S.R.R. Administration. A book the railway world has long been awaiting. It explains clearly the use of the elaborate railway accounts and shows how accounting figures can be shown to reflect accurately the efficient or inefficient operations of a road as a whole or of any department. It is invaluable to all statisticians and analysts in the transportation, maintenance and mechanical departments and also to accounting department employees. 381 pages, illustrated, 6 x 9 inches. Price $4.00.

Handbook of Railway Blacksmithing

A. B. Clemens. A handy set of two books containing the essential facts of railway blacksmithing with reference to best practices, modern tools and difficult jobs.
Two volumes. Vol. I, 217 pages, 183 illustrations, 5 x 7¾ inches, $2.25. Vol. II, 247 pages, 212 illustrations, cloth, 5 x 7¾ inches, $2.25. Price of set $4.00.

Locomotive and Boiler Inspectors' Handbook

Compiled by A. J. O'Neil. A book essential to every present or prospective locomotive and boiler inspector. It gives valuable information in the form of questions and answers about the inspector's duties—information which anyone planning to take the locomotive and boiler inspector's examination should have. All Federal laws and Interstate Commerce Commission requirements are included. 300 pages, 5 x 7¾ inches, illustrated. Cloth, $2.50.

Simmons-Boardman
10-Day Free Examination Coupon

SIMMONS-BOARDMAN PUBLISHING CO.,
30 Church Street,
New York, N. Y.

Send me postpaid for 10 DAYS' FREE EXAMINATION the book or books I have listed below. It is understood that I may return all of them if I so desire at the end of 10 days, or I will remit the full net amount on each book I have kept.

.....

.....

.....

NAME ..... (Please Print)

ADDRESS .....

CITY..... STATE.....

ROAD..... POSITION.....

M. T.—Bookshelf 9-26

Car Inspectors' Handbook

E. W. Hartough. Covers the routine of ordinary inspection and also contains chapters on interchange, the work of wrecker and crew, etc. 271 pages, 69 illustrations, cloth, 5x7¼, $2.50.

Laying Out for Boiler Makers and Sheet Metal Workers

A practical work which describes the various problems simply and clearly, without going deeply into mathematics. Gives information as to the layout of everyday jobs, with calculations necessary to determine the sizes of parts, miscellaneous problems, etc. Fourth edition, revised and improved. 374 pages, illustrated, 9 x 12. $8.

Locomotive Valve Setting

Jack Britton. Helpful shop hints about valve settings and "running engines over" for Stephenson, Walschaert and Baker gears, on both outside and inside admission engines. Written in everyday shop language by a master mechanic who was formerly an apprentice instructor. 192 pages, 64 illustrations, flexible imitation leather, 5x7¼. $2.50.

The Making of a Railroad Officer

R. E. Woodruff, Superintendent, Erie Railroad. An interesting study of the human interest side of a railroad man's job and of those qualities and traits which make successful railroad officers. It is the most comprehensive book on its subject written in many years and reads with all the fascination of a gripping novel. 245 pages, illustrated, 5 x 7¼ inches. Price, $2.00.

Personnel Management on the Railroads

By the Policyholders' Service Bureau of the Metropolitan Life Insurance Company under the direction of Henry Bruere. A practical study of personnel problems on railroads based on information gathered from eight large railroads. 226 pages, illustrated, cloth, 5 x 7¾ inches. $2.00.

Railroad Electrification and the Electric Locomotive

Arthur J. Manson, E. E. Electrification problems and methods of operation, with a description of mechanical features, for men whose roads are wholly or partially electrified. 332 pages, 148 illustrations, cloth, 6 x 9. $4.

Railroad Operation

Ernest Cordeal. The work of the operating department explained from the standpoint of common sense and many years' practical experience. 244 pages, 26 illustrations, bound in cloth, 5 x 7¾ inches. $2.00.

Railway Accounting Procedure

1926 edition compiled by E. R. Woodson, Secretary, Railway Accounting Officers' Association. The standard reference book on railway accounting in a new edition enlarged one-half over the previous edition. It is an absolute necessity to any railway accounting man who has any respect for his profession and desires to progress in it and will prove invaluable also to other accountants and railway workers in other departments. 885 pages, illustrated, 6¼ x 9¼ inches. Price, $3.00.

Railways of the World

Talbot. A fascinating description of the history and evolution of the modern railroad, with special reference to the highlights which have marked this momentous development. Interesting reading from a lay standpoint, authoritative enough to satisfy the most critical railroad man.
Two volumes (Not sold separately) profusely illustrated, richly bound, 728 pages, 8½ x 10¾. Price of set, $10.00.

Rights of Trains

Harry W. Forman. Complete analysis of Standard Code Rules in the form of lectures, questions and answers. A new revision of a standard book. 600 pages, 135 illustrations, cloth, 5 x 7¾ inches, $3.

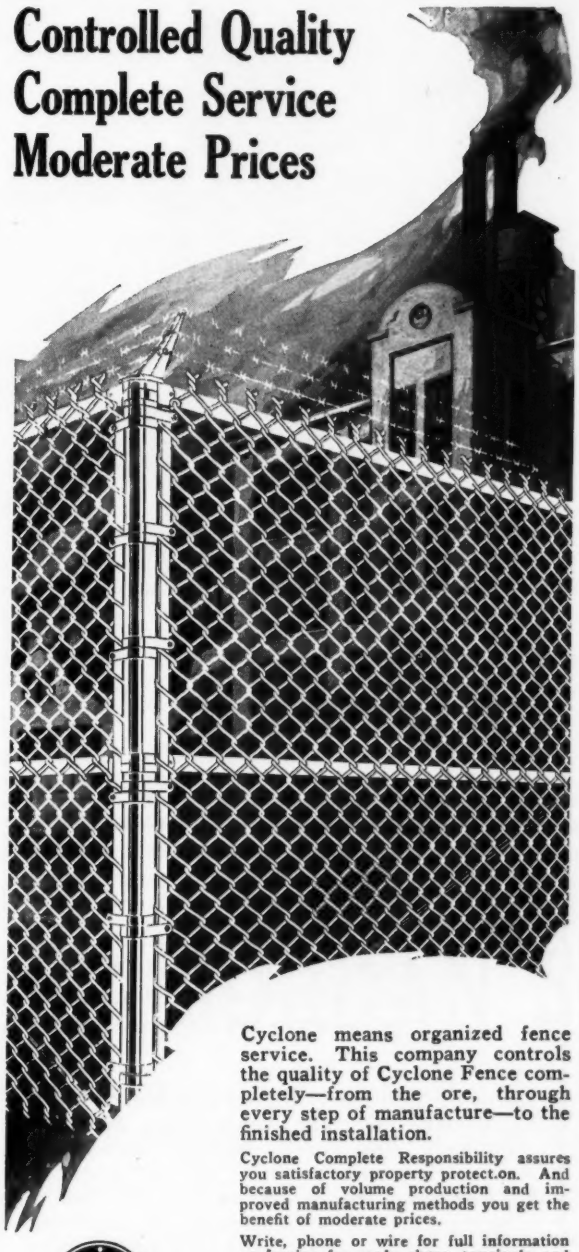
Study of the Locomotive Boiler

Lawford H. Fry. Describes the combustion process, shows how to compute efficiency, heat balance, etc. The author is an internationally known authority. 151 pages, 82 tables and diagrams, cloth binding, 6 x 9. $3.00.

United States Safety Appliances

H. S. Brautigam. Much information hitherto unavailable, with the rest usually found in books on safety appliances for all classes of rolling stock. The author was formerly Chief Safety Appliance Inspector, Chicago, Milwaukee & St. Paul. Vest pocket size, 232 pages, 46 figures, heavy paper cover. $1. Attractive discounts on quantity orders.

Controlled Quality
Complete Service
Moderate Prices



Cyclone means organized fence service. This company controls the quality of Cyclone Fence completely—from the ore, through every step of manufacture—to the finished installation.

Cyclone Complete Responsibility assures you satisfactory property protect.on. And because of volume production and improved manufacturing methods you get the benefit of moderate prices.

Write, phone or wire for full information on fencing for yards, shops, terminals, and rights of way.

We also manufacture Wrought Iron Fence for park, station, and intertrack use.

The Mark of Quality Fence and Service

CYCLONE FENCE COMPANY

Factories and Offices:
Waukegan, Ill. Cleveland, Ohio
Newark, N. J. Fort Worth, Texas

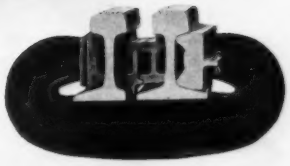
Pacific Coast Distributors:
Standard Fence Co., Oakland, Calif.
Northwest Fence & Wire Works, Portland, Ore.

Cyclone Fence
Reg. U. S. Pat. Off.

CYCLONE COPPER-BEARING STEEL ENDURES

© C.F.Co. 1926

"ACCO" Drop Forged Guard Rail Clamp



"RESCO" Cast Steel Guard Rail Clamp

Guard Rail Clamps

"ACCO"

drop forged guard rail clamp

This clamp proved its sturdy dependability in thousands of installations, where traffic is almost continuous, and rolling stock the heaviest now in use.

Made of finest open-hearth steel forged to shape and heat-treated—combined with highest grade open hearth cast steel heat-treated fittings.

"RESCO"

cast steel guard rail clamp

The Resco Clamp combines all the recognized advantages of cast steel clamps, being made of high grade open hearth steel and heat treated after casting.

Yokes are interchangeable and can be used on various rail sections by application of suitable blocks. Clamps can be applied without disturbing guard rail.

The new Reading Catalog illustrates all the Reading Specialties listed below. We will forward a copy of the new Reading Catalog—illustrated—on request.

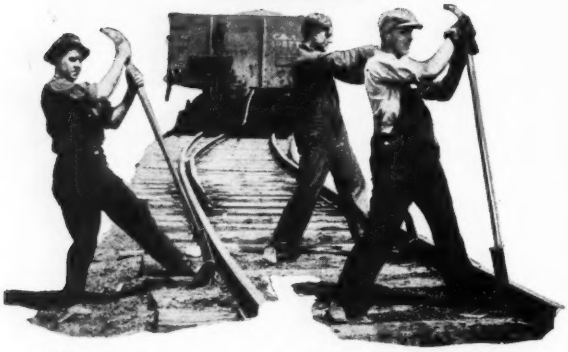
AMERICAN CHAIN CO., Inc.
Reading Specialties Division
Bridgeport, Connecticut

District Sales Offices: Boston, Chicago, New York, Philadelphia, Pittsburgh, Portland, San Francisco

READING SPECIALTIES

"ACCO" One-Piece Guard Rails, "ACCO" Drop-Forged and "RESCO" Cast Steel Guard Rail Clamps, READING "SAMPSON" Type Rail Benders, "READING" Reversible Rail Benders, Compromise or Step Joints, Car and Engine Replacers and Replacer Clamps.

BLOXHAM
Track Liners



Here's a means of lining track that will save two-thirds of track lining labor. Three men with Bloxham Liners do the work of eight to eleven with ordinary lining bars.

The Bloxham Liner is quickly set against the base of the rail and a downward pull aided by the weight of the body does the work. A double bearing makes "heeling up" for the second move unnecessary.

Full information or a demonstration on request.

Chicago Steel Foundry Co.
Kedzie Ave. at 37th St., Chicago, Illinois

S. Douglas Gibson, Suite 744,
Transportation Bldg., Washington, D. C.
J. J. Crawford,
Stahlman Bldg., Nashville, Tenn.
W. R. McDonough & Co.,
National Bldg., Cleveland, Ohio
Hubbell & Sharp,
1712-1714 Chestnut St., St. Louis, Mo.
Track Specialties Co.,
29 Broadway, New York City
Jobbers Sales Corp.,
New Orleans, La.

BLOXHAM
Track Liners

RE&M9—Gray

Kyrock passenger platforms and driveway L. & N. R. R. Co., Bowling Green, Ky. "Kyrock" surfacing used exclusively on all driveways, passenger and trucking areas around this magnificent depot.

Kyrock

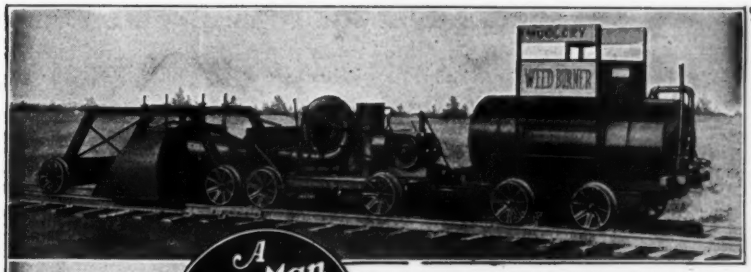
was specified *exclusively* for these L. & N. driveways and platforms because test installations extending over years had proved it to be better—simpler to use, more durable, easier to maintain. Try Kyrock on your most difficult area and let it prove its superior worth to *you.*

Kyrock is laid *cold.* Stored in the open without damage. Perfect waterproofing and nonconductor. Requires no mixing or heating. Any section crew can lay "Kyrock" successfully without special equipment. For grade-crossings, bridge floors, shop floors, passenger and trucking platforms it offers you simpler construction, longer life, easier maintenance.

Write today for your copy of "Kyrock for Railway Construction and Maintenance."

KENTUCKY ROCK ASPHALT CO.
Incorporated
Louisville, Ky.

Kyrock The **Perfect Pavement**



A Two-Man Outfit of Guaranteed Efficiency Average cost on first heavy burning less than $3.00 per mile

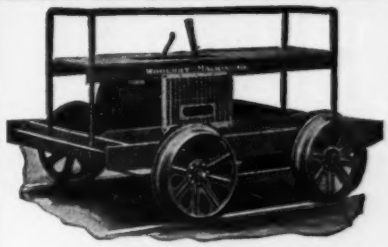
Woolery Railway Weed Burners

(Patent Applied For)

Based on the principle that "A penny saved is a penny earned," a Woolery Railway Weed Burner will make big dividends on the investment for any Railroad having 300 miles of weedy track.

It burns low grade, dark distillate oil.

A Demonstration can be arranged on Your Road.



WOOLERY

Railway Motor Cars and Motor Car Engines

Medium Weight
Extraordinary Strength
Excellent
Safety Features

Made in direct Belt Drive and 2-Speed Bevel Gear Transmission — Power according to requirements—5, 7½ or 10 H.P.

WOOLERY MACHINE CO. *Write for Prices and Further Information* **Minneapolis, Minn.**

JORDAN SPREADER

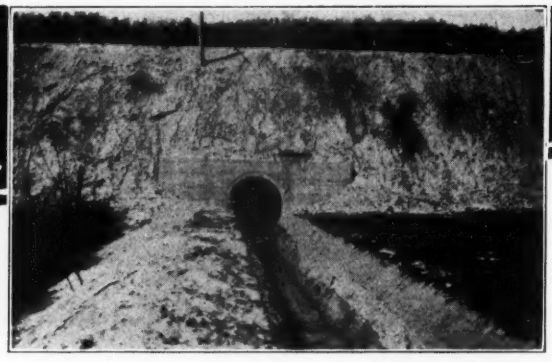
The Composite Spreader-Ditcher, which is the Jordan Spreader with the composite Spreader-Ditcher Attachment, performs all the functions of the Spreader (moves earth, spreads bulky materials, plows snow) and in addition will shape the ballast and subgrade, form new ditches or clean old ones, and trim the banks of cuts to a uniform slope.

JORDAN SPREADER
"Does the Work of an Army of Men"
SNOW PLOW ★ ICE CUTTER
UNIVERSALLY
STANDARD
★ DITCHER ★
O. E. JORDAN COMPANY
WALTER J. RILEY, PRESIDENT
EAST CHICAGO, INDIANA

An all-year Machine. In use on North America's leading railroads.

Write for Copy of New Catalog

Protection from soft track



Many miles of soft track have been eliminated by replacing antiquated box culverts with Massey Reinforced Concrete Pipe. Massey Pipe never wears out.

MASSEY

CONCRETE PRODUCTS CORPORATION

Peoples Gas Building, Chicago

Sales Offices: New York Atlanta Cincinnati St. Louis San Francisco Los Angeles

CANADIAN CONCRETE PRODUCTS CO., Limited, Transportation Bldg., MONTREAL, QUE.

REM9-Gray

HERE IS A MIGHTY GOOD CAR!

KOPPEL

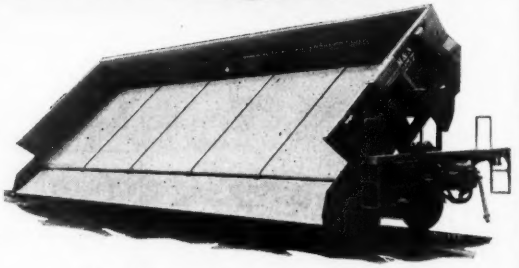
THE KOPPEL AUTOMATIC AIR DUMP CAR

Built to give service—positive in action—a clean, free discharge—either drop or lift door types available.
Drop Door Type—20 and 30 yds. capacity.
Lift Door Type—12, 16, 20, 30 and 50 yds. capacity.

Write for literature

KOPPEL INDUSTRIAL CAR & EQUIPMENT CO.
Koppel, Penna.

Sales Offices:
Pittsburgh New York Chicago San Francisco



The *Drop Door—a clean discharge*

The DURABLE BUMPING POSTS Stop More Than Cars—

6. Troubles in Winter Moving

Every maintenance of way man knows what a huge job it is to move the ordinary bumping post in the dead of winter. To begin with, it is frozen in, and many a maintenance man has wished that the company would allow him to use dynamite instead of forcing him to use pick and shovel.

But, difficult as it is to dig out the ordinary bumping post in winter, it is still harder to install one. With the ground frozen as solid as concrete, it is next to impossible to go through with picks and shovels. The labor cost of moving such a post in winter is two or three times as high as the same operation in summer.

The cost of moving **Durable** Bumping Posts is the same the year 'round—and much lower than the expense of moving ordinary bumping posts. No digging is required to install or move a **Durable**. Standardize on **Durables** and eliminate those costly winter troubles.

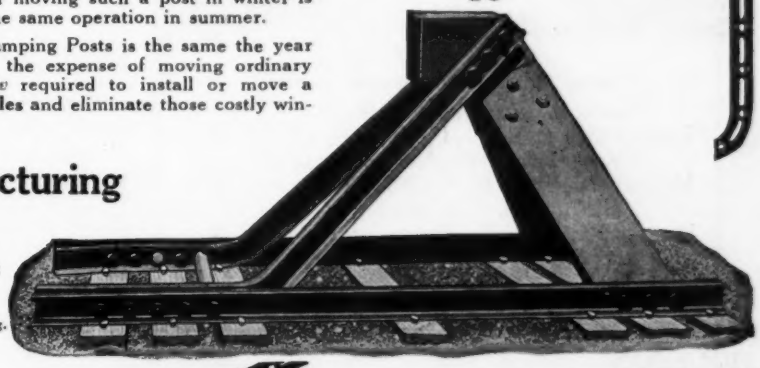
Mechanical Manufacturing Company

Pershing Road and Loomis Street
Chicago, Illinois

Room 323-E Hudson Terminal Bldg.
30 Church St., New York City
Telephone Cortlandt 1331

It Stops

1. Excessive Cost of Installation.
2. Waste of Valuable Track Space.
3. Unnecessary Digging up of Track.
4. Uncertainty as to its Condition.
5. Jeopardy to Property and Human Life.
6. Troubles in Winter Moving.
7.
8.
9.
10.



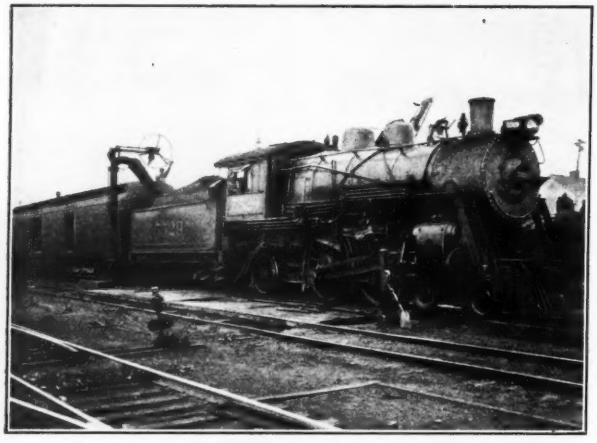
The Durable Freight Bumping Post stands like a sentinel at the end of the track—stopping all cars which attempt to pass.

WOODINGS FORGE & TOOL CO.
VERONA, PA.

STANDARD TRACK TOOLS OF VERY HIGH QUALITY

We Respectfully Solicit
Your Inquiries

Works and General Sales Office
Verona, Pa.



Layne Wells and Pumps furnish water to these Railroads.

Pennsylvania R. R. Baltimore & Ohio R. R.
Chicago, Rock Island & Pacific R. R.
Missouri Pacific R. R. Illinois Central R. R.
St. Louis & Southwestern R. R.
Wabash Railway Florida East Coast R. R.
Wheeling & Lake Erie R. R.

WHERE GUESSWORK IS NOT TOLERATED

The railroad watering station *must* operate efficiently day and night. When the locomotive which pilots the limited, or its lowly sister which toils laboriously over the grades with its string of heavily loaded freight cars, need water, there must be a supply on hand. There is no time to lose. The destiny of a nation may depend on their timely arrival.

With twenty-four years of successful operation to their credit, Layne Wells and Vertical Centrifugal Pumps have proven their superiority. The leading railroads have accepted this proof. The Layne organization constructs wells on an engineering basis which eliminates the element of chance. That is why railroads place their faith in Layne Wells.

Layne & Bowler Manufacturing Company

HOUSTON MEMPHIS LOS ANGELES

HAVE YOU RESERVED SPACE FOR THE ROADMASTERS' CONVENTION ISSUE

(October Issue)
of

Railway Engineering and Maintenance

If not, write, wire or phone now

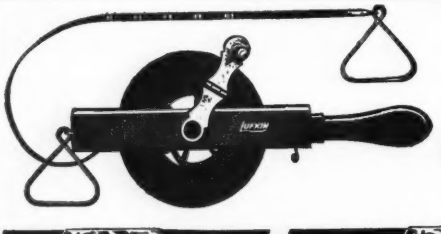
Railway Engineering & Maintenance

608 S. Dearborn St.
Chicago, Ill.

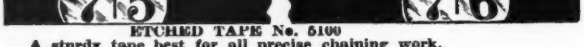
6007 Euclid Ave.
Cleveland, O.

30 Church St.
New York, N. Y.

FORMS CLOSE SEPTEMBER 10



LUFKIN CHAIN TAPES



ETCHED TAPE No. 5100
A sturdy tape best for all precise chaining work.
½-gage mark when specified.

"MICHIGAN" CHAIN TAPE
Graduated on Babbitt Metal
Most popular for rough survey and maintenance work.
½-gage mark when specified.

ENGINEER'S PATTERN TAPES — WOVEN TAPES OF ALL GRADES

Send for Catalogue

WINDSOR, ONT.
LONDON, ENG.

THE LUFKIN RULE CO.

SAGINAW, MICH.
NEW YORK

DIXON'S PAINT

Red-Lead-Graphite Primer
Aluminum-Graphite
Silica-Graphite

Consider the high cost of repainting and use one of Dixon's Paints. They will give better protection for exposed metal or wood work at lowest cost and meet the requirements of all specifications.

The pigment, flake silica-graphite, provides a tough, yet elastic, film that expands and contracts with heat and cold without cracking or peeling. The graphite and silica are naturally and not artificially combined resulting in long life, efficient surface protection, elasticity and resistance to dampness.

Write for Booklet 187-B, "Protective Paint"

Joseph Dixon Crucible Company
Jersey City, N. J. **Established 1827**

Cast Iron Pipe and Fittings for all purposes

Cast Iron Culverts

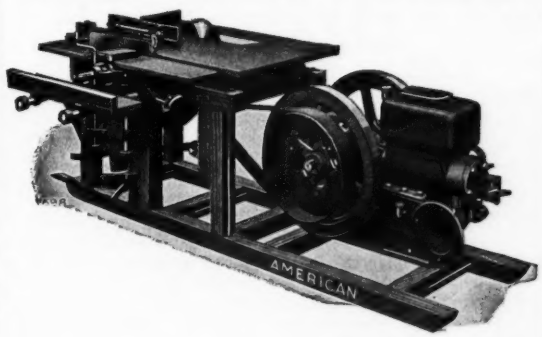
Write for illustrated literature describing the manufacture of centrifgually cast cast iron pipe.

United States Cast Iron Pipe and Foundry Company

Philadelphia, Chicago, Birmingham, Buffalo, Cleveland, New York, San Francisco, Pittsburgh, Dallas, Kansas City, Minneapolis

General Offices
Burlington, New Jersey

COST CUTTERS



Portable Woodworking Machinery for use on the job.

Saw Mills, Woodworkers, Planers, Jointers, Band Saws, Re-saws, Cut-off Saws.

Ask for Complete Catalog

American Saw Mill Machinery Co.
164 Main Street **Hackettstown, N. J.**

UNIVERSAL POWER CAR

FOR MAINTENANCE-OF-WAY FORCES

TYPE A

Takes the men to the job and works when it gets there

A GAS-ELECTRIC POWER PLANT

Develops 110 volts a.c. and d.c. current for operating all Electric Tools such as, Grinding Tools, Portable Rail Saws, Track and Bonding Drills, Electric Tie Tampers, Flood Lighting Systems, Portable Saws and Boring Tools for Carpenters and Bridge Gangs, Electric Driven Air Compressors for Sand-Blasting and Paint Spraying, and all other Electric Tools essential to maintenance work.

DEPENDABLE—ECONOMICAL—FLEXIBLE

CAN BE OPERATED BY UNSKILLED WORKMEN

Electrically Driven, No Friction Discs, Gear Shifts or Clutches
Four Men Can Easily Remove Car From Tracks

THE EUCLID ELECTRIC & MFG. CO.
EUCLID, OHIO

Every Railroad
should use

Murdock
Drinking Fountains

Because they are constant in service, fool-proof, practically indestructible and therefore especially adapted to railroad service.

Pedestal Fountains
Wall Fountains
MURDOCK Patent Bubbler Head
MURDOCK PATENT Outdoor Bubble Font, anti-freezing
"Genuine" Murdock Compression and Self-closing Hydrants
Large Hydrants
Fire Hydrants
Railway Water Service Boxes for train sheds, coach yards and cinder pits

The Murdock Mfg. & Supply Co.
Cincinnati, Ohio

Makers of Outdoor Water Devices Since 1853

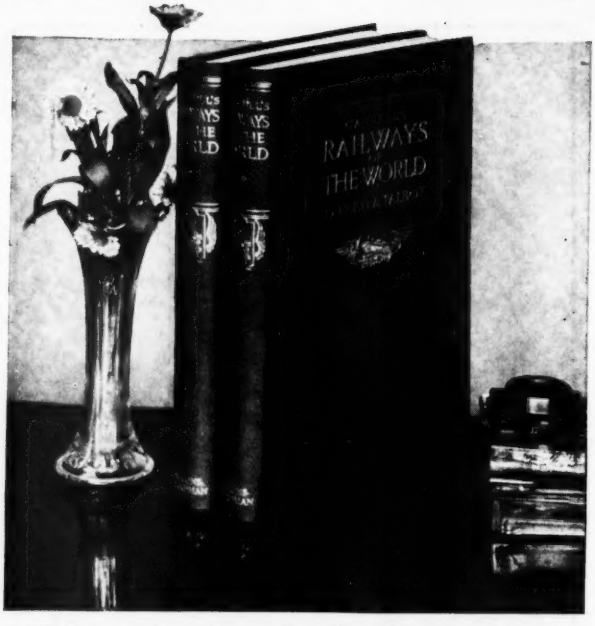
Genasco is standard on leading railways

All over the United States leading railway systems use Genasco Asphaltic Protective Products, because of their long-wearing qualities. You'll find it to your advantage to get the complete information about these Genasco products:

Genasco Ready Roofings (Smooth and Slate Surface)
Genasco Sealbac Shingles (Individual and Strip)
Genasco Latite Shingles
Genasco Standard Trinidad Built-up Roofing
Genasco Membrane Waterproofing
Genasco Waterproofing Asphalts
Genasco Waterproofing Felts
Genasco Asphalt Fibre Coating
Genasco Asphalt Pipe Coating
Genasco Rustless Slushing Compound
Genasco Asphalt Mastic
Genasco Liquid Asphalt Roof Coating
Genasco Industrial Paint
Genasco Asphalt Putty
Genasco Battery Seal Asphalt
Genasco Battery Paint
Genasco Acid-Proof Paint
Genasco Asphalt Saturated Felt
Genasco Deadening Felt
Genasco Insulating Paper
Genasco Red Sheathing Paper
Genasco Stringed Felt
Genasco Stucco Base
Barber Brand Cold Repair Cement (for more permanent crossings than wooden planks and for platform construction)
Genasco Acid-Proof Mastic
Genasco Insulating Asphalt (for use in Box Car Construction)

The Barber Asphalt Company
1600 Arch Street, Philadelphia

New York Chicago Pittsburgh St. Louis
Kansas City San Francisco



The Colorful Story of RAILWAYS of the WORLD

2 Vols., 8½x10¾, Cloth binding $10.00
(Not Sold Separately)

In these two volumes the author presents a survey of railroad achievements the world over. With a fascinating story of adventure he takes the reader from Australia to the Andes, from North America, over the railroads of Continental Europe, to the Malays. Graphically and accurately, aided by hundreds of beautiful illustrations, he presents the eternal struggle of the engineering, motive power and traffic forces as they overcame the obstacles of nature and united in making world history.

52 Startlingly Interesting Chapters

It would be difficult to say which of the fifty-two chapters of this work are most interesting. For instance:

Train Operation by Wireless.
The Key to the Congo.
The Story and Development of the "Consolidation."
Crossing the Andes by Rail.
Driving and Doubling the World's Largest Tunnel.
The Mallet Articulated Compound Locomotive.
Where the Snow-Plow Works in Summer.

There are 728 pages written in a smooth and facile manner, avoiding the use of technical terms, the book is of interest to every one,—the railroad man and his family, the engineer, the banker, the layman, to every one, in short, who is thrilled by a story of adventure and tremendous achievements.

See a Copy FREE for 10 DAYS!

You are under no obligation whatsoever to buy these two books unless you find it meets with your entire satisfaction. You can take ten days to make this decision. If at the end of that time you feel you are not satisfied with the books just return them at our expense. This shows you how confident we are that you will find a place in your library for "Railways of the World."

SIMMONS-BOARDMAN
10-Day Free Examination Coupon

Simmons-Boardman Publishing Company,
30 Church Street,
New York City, N. Y.

Send me postpaid for 10 DAYS' FREE EXAMINATION the two volumes of "Railways of the World." If I desire to keep these books I will send you a check for ten dollars or I will remit $2.00 in ten days and $2.00 monthly for 4 months, a total of $10.00. If I do not wish to keep the books I will return them to you in good condition, at your expense.

NAME .....
(Please Print)
ADDRESS .....
CITY..... STATE.....
ROAD..... POSITION.....
MT-9-26

WHARTON

It is where traffic is the heaviest, where the pounding is severest, that Wharton Tisco Manganese Steel Trackwork shows to best advantage.

Wm. Wharton Jr. & Co., Inc.

Easton, Pa.

OFFICES:

Boston Chicago El Paso Montreal New York
Philadelphia Pittsburgh San Francisco Scranton

Thirsty Engines

Thirsty engines can Always get water at a station using

Sullivan Air Lift

That is the beauty of the system—there are no moving parts in the well to wear out—well is not affected by mud or sand—and changing water level is followed with only slight variation in efficiency. You get more water than with mechanical pumping and get it all the time. For shallow or deep wells, or crooked or straight ones. Get Bulletin 19129.

SULLIVAN TRADE MARK
MACHINERY COMPANY
411 Peoples Gas Bldg., Chicago

LIME-SODA WATER SOFTENERS

We make LIME-SODA WATER SOFTENERS of both the ground operated and top operated types to purify water for prevention of scale deposits and corrosion in locomotive boilers.

There is no investment that a railroad can make which will yield greater dividends, if it operates in a hard water district, than to invest in AMERICAN LIME-SODA WATER SOFTENERS.

At the present time we are installing WATER SOFTENERS on four well-known AMERICAN RAILROADS, on which we made our first installations more than twenty years ago. These plants represent additional repeat orders we have gotten for new plants and enlargements during this time.

Will you please let us have your specifications for water treating plants?

We are qualified by organization and experience to give you service. Write for our literature.

AMERICAN WATER SOFTENER CO.

FAIRHILL P. O. PHILADELPHIA, PA.

Specialists for twenty-four years in Railroad

WATER PURIFICATION

"Not a Kick in a Million Feet"

MULE-HIDE NOT A KICK IN A MILLION FEET ROOFING AND SHINGLES

He profits *most*
who buys the *best*

This statement is particularly true in its application to the purchase of roofing materials.

With the significant fact ever before us, that the labor or application cost remains the same regardless of the quality of the material used it would seem "penny wise" to select at the start, only such quality materials as would be in keeping with the labor cost of employing them.

There is a particular type of Mule Hide roof to meet the needs of any type of building. Samples and prices submitted cheerfully.

THE LEHON COMPANY
44th to 45th Street on Oakley Ave.
Chicago, Ill.

Buyers' Guide

CLASSIFIED INDEX TO ADVERTISERS

Acetylene, Dissolved.
Oxweld Railroad Service Co.

Air Compressors.
Fairbanks, Morse & Co.
Gardner Governor Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Air Generator Set
Buda Co.

Air Hoists.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Air Lift Pumping Machinery.
Gardner Governor Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Anchors, Rails.
See Rail Anchors.

Anti-Creepers, Rail.
Bethlehem Steel Co.
Lundie Engineering Corp.
Verona Tool Works

Ash Conveyors.
McMyler Interstate Co.

Asphalt.
Barber Asphalt Co.
Kentucky Rock Asphalt Co.
Lehon Co.

Ballast Cars.
Clark Car Co.

Ballast Spreaders.
Jordan Co., O. F.
Western Wheeled Scraper Co.

Band Saws
American Saw Mill Machinery Co.

Bars.
Bethlehem Steel Co.
Interstate Iron & Steel Co.

Bearings, Axle.
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Bearings, Roller.
Hyatt Roller Bearing Co.

Benders, Rail.
See Rail Benders.

Blasting Powders
DuPont de Nemours & Co.

Blasting Supplies
DuPont de Nemours & Co.

Bonding Outfits, Rail.
Ingersoll-Rand Co.

Bolts.
Bethlehem Steel Co.

Buckets.
McMyler Interstate Co.
Owen Bucket Co.

Buckets, Clam Shell.
Industrial Works.
McMyler Interstate Co.
Owen Bucket Co.

Building Beams, Concrete.
R. C. Products Co., Inc.

Building Papers.
Lehon Co.

Bumping Posts.
Buda Co.
Mechanical Manufacturing Co.

Calcium Carbide
Oxweld Railroad Service Co.

Car Dumpers.
McMyler Interstate Co.

Cars, Ballast.
See Ballast Cars.

Cars, Dump.
See Dump Cars.

Cars, Hand.
Buda Co.
Fairbanks, Morse & Co.
Fairmont Ry. Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.

Cars, Industrial.
Clark Car Co.
Differential Steel Car Co.
Koppel Industrial Car & Equipment Co.
Western Wheeled Scraper Co.

Cars, Inspection.
Buda Co.
Euclid Electric & Mfg. Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Cars, Motor.
Buda Co.
Euclid Electric & Mfg. Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Cars, Section.
Buda Co.
Euclid Electric & Mfg. Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Cars, Spreader.
Clark Car Co.
Jordan Co., O. F.
Western Wheeled Scraper Co.

Cars, Velocipede.
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Mudge & Co.
Northwestern Motor Co.

Castings.
Bethlehem Steel Co.
Wharton, Jr., & Co., Inc., Wm.

Cattle Guards.
Fairbanks, Morse & Co.
Kalamazoo Railway Supply Co.

Cattle Passes.
Massey Concrete Products Corp.

Cement Compound
North American Cement Corp.

Cement Repair
Barber Asphalt Co.

Chains.
American Chain Co., Inc.

Clamshell Buckets.
See Buckets, Clamshell.

Coal, Ore & Ash Handling Machinery
McMyler Interstate Co.

Coaling Stations
Fairbanks, Morse & Co.

Combination Crane Pile Driver.
Industrial Works.

Compressors
Ingersoll Rand Co.
Sullivan Machinery Co.
Gardner Governor Co.

Compromise Joints.
See Joints, Compromise.

Concrete Units, Miscellaneous
R. C. Products Co., Inc.
Massey Concrete Products Corp.

Condensers.
Ingersoll-Rand Co.

Conveying Machinery
McMyler Interstate Co.

Corrugated Iron.
Armco Culvert & Flume Mfrs. Assn.
United Alloy Steel Corp.

Cranes, Barge, Electric, Erecting, Gantry, Locomotive, Pillar, Transfer, Tunnel, Wharf and Wrecking.
Industrial Works.
McMyler Interstate Co.

Creosoted Timber.
See Timber, Creosoted.

Cribbing, Concrete.
Federal Cement Tile Co.
R. C. Products Co., Inc.
Massey Concrete Products Corp.

Crossing Gates.
Buda Co.
Kalamazoo Railway Supply Co.

Crossings, Highway
Kentucky Rock Asphalt Co.

Crossings, Rail.
Buda Co.
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wharton, Jr., & Co., Inc., Wm.

Crushers, Stone.
Western Wheeled Scraper Co.

Culvert Pipe.
Armco Culvert & Flume Mfrs. Assn.
Massey Concrete Products Corp.
United Alloy Steel Corp.

Curbing.
Massey Concrete Products Corp.

Derails.
American Chain Co., Inc.
Q. & C. Co.
Wharton, Jr., & Co., Inc., Wm.

Derricks
McMyler Interstate Co.

Diesel Engines.
Fairbanks, Morse & Co.

Diesel Electric Power Plants
Fairbanks, Morse & Co.

Dieing Machines
Fairmont Railway Motors, Inc.

Ditchers.
Jordan Co., O. F.

Ditching Machinery.
McMyler Interstate Co.

Dredging Machinery.
McMyler Interstate Co.

Drills, Earth
Buda Co.

Drills, Pneumatic
Ingersoll Rand Co.
Sullivan Machinery Co.

Drills, Rock.
Ingersoll-Rand Co.
Sullivan Machinery Co.
Verona Tool Works.

Drill Steel, Rock.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Drills, Track.
Buda Co.
Railroad Accessories Corp.
Ingersoll-Rand Co.
Kalamazoo Railway Supply Co.

Drinking Fountains.
Murdock Mfg. & Supply Co.

Dump Cars.
Clark Car Co.
Differential Steel Car Co.
Jordan Co., O. F.
Koppel Industrial Car & Equipment Co.
Western Wheeled Scraper Co.

Dynamite
DuPont de Nemours & Co.

Electric Cranes (Locomotive, Pillar, Transfer & Wrecking).
See Cranes.

Electric Light & Power Plants
Fairbanks, Morse & Co.

Electric Power Units
Electric Tamper & Equipment Co.
Euclid Electric & Mfg. Co.

Electric Snow Melters.
Q. & C. Co.

Engines, Gasoline.
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Ingersoll-Rand Co.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Engines, Hoisting
McMyler Interstate Co.

Engines, Motor Car.
Buda Co.
Euclid Electric & Mfg. Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors Co.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Engines, Oil.
Fairbanks, Morse & Co.
Ingersoll-Rand Co.

Explosives
DuPont de Nemours & Co.

Fences.
Cyclone Fence Co.

Fence Fabric.
Cyclone Fence Co.
Interstate Iron & Steel Co.

Fence Posts.
Massey Concrete Products Corp.
Q. & C. Co.

Fibre Insulation.
Q. & C. Co.

Fibre Angle Pieces, Bushings, Plates, Etc.
Q. & C. Co.

Filters.
American Water Softener Co.

Float Valves
Fairbanks, Morse & Co.

Floor Coverings.
Barber Asphalt Co.
Lehon Co.

Forgings.
Bethlehem Steel Co.
McMyler Interstate Co.

Frogs.
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton, Jr., & Co., Inc., Wm.

Gages, Measuring.
Lufkin Rule Co.

Girder Rails.
Bethlehem Steel Co.

Governors.
Gardner Governor Co.

Graders, Elevating.
Western Wheeled Scraper Co.

Grading Machinery.
Western Wheeled Scraper Co.

Graphite.
Dixon Crucible Co., Jos.

Grinders, Portable.
Buda Co.
Ingersoll-Rand Co.

Guard Rails.
American Chain Co., Inc.
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton, Jr., & Co., Inc., Wm.

Guard Rail Clamps.
American Chain Co., Inc.
Bethlehem Steel Co.
Buda Co.
Q. & C. Co.
Ramapo Ajax Corp.
Wharton, Jr., & Co., Inc., Wm.

Hammer Drills.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Hammers, Forge.
Sullivan Machinery Co.

Hammers, Riveting.
Ingersoll-Rand Co.
Verona Tool Works.

Hammers, Steam.
Industrial Works.

Heaters, Feed Water.
American Water Softener Co.

Hoisting Machinery
Fairbanks, Morse & Co.
Ingersoll Rand Co.
McMyler Interstate Co.

Hose.
Ingersoll-Rand Co.

House Lining, Paper
Barber Asphalt Co.
Lehon Co.

Hydrants, Fire.
Murdock Mfg. & Supply Co.

Hydrants, Self Closing.
Murdock Mfg. & Supply Co.

Inspection Cars.
See Cars, Inspection.

Insulating Material
Barber Asphalt Co.

Insulated Rail Joints.
Bethlehem Steel Co.
Rail Joint Co.

Jacks, Bridge
Buda Co.

Jacks, Track.
Buda Co.
Hackmann Railway Supply Co.
Kalamazoo Railway Supply Co.
Verona Tool Works.

Joints, Compromise.
American Chain Co., Inc.
Bethlehem Steel Co.
Rail Joint Co.

Joints, Rail.
American Chain Co., Inc.
Bethlehem Steel Co.
Q. & C. Co.
Rail Joint Co.

Joints, Step.
American Chain Co., Inc.
Q. & C. Co.
Rail Joints Co.

Junction Boxes.
Massey Concrete Products Corp.

Knuckles, Emergency.
Q. & C. Co.

Leaders, Pile Driver.
Industrial Works.

Liners, Track.
Chicago Steel Foundry Co
Hackmann Railway Supply Co.
Rail Joint Co.

Lock Washers.
National Lock Washer Co.
Reliance Manufacturing Co.

Locomotives, Oil Engine, Electric Driven.
Ingersoll Rand Co.

Locomotive Cranes.
Industrial Works.

Lubricants.
Dixon Crucible Co., Jos.

Machinery, Grading.
See Grading Machinery.

Manganese Track Work.
Bethlehem Steel Co.
Buda Co.
Ramapo-Ajax Corp.
Wharton, Jr., & Co., Inc., Wm.

Manholes.
Massey Concrete Products Corp.

Markers.
Massey Concrete Products Corp.

Mechanical Painting Equipment
Matthews Corp., W. N.

Mile Posts.
Massey Concrete Products Corp.

Motor Car Accessories
Mudge & Co.

Motor Car Bearings.
Hyatt Roller Bearing Co.

Motor Cars.
See Cars, Motor.

Motors and Generators
Fairbanks, Morse & Co.

Mowing Machines, Weed
Fairmont Railway Motors, Inc.
Mudge & Co.

Nails
Interstate Iron & Steel Co.

Nut Locks.
National Lock Washer Co.
Reliance Manufacturing Co.
Verona Tool Works.
Wooding Forge & Tool Co.

Nuts.
Bethlehem Steel Co.

Oil Engines.
See Engines, Oil.

Out Houses.
Massey Concrete Products Corp.

Oxygen.
Oxweld Railroad Service Co.

Paint.
Dixon Crucible Co., Jos.

Paint, Metal Protecting.
Barber Asphalt Co.
Dixon Crucible Co., Jos.

Paint Spraying Equipment
Matthews Corp., W. N.

Pavement Breakers.
Ingersoll-Rand Co.
Sullivan Machinery Co.

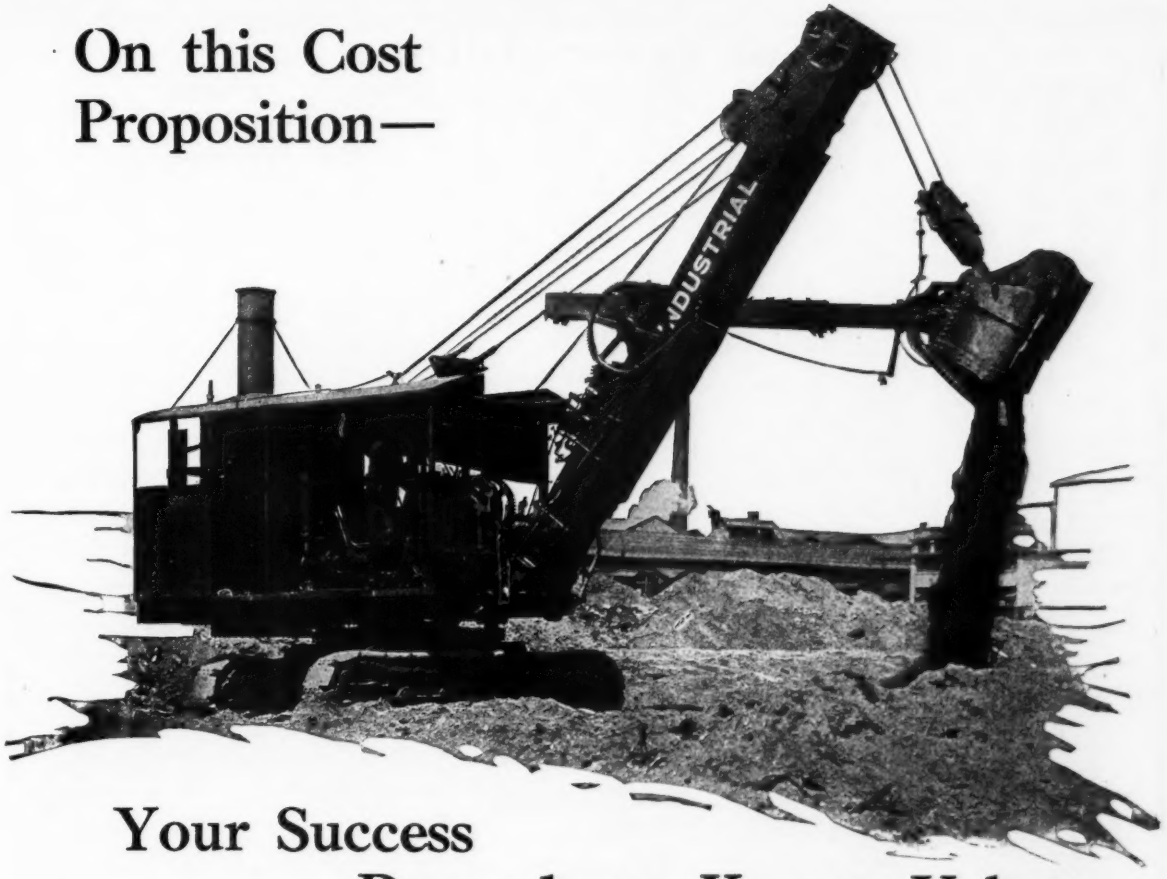
Penstocks.
Fairbanks, Morse & Co.

Pile Drivers.
Industrial Works.
McMyler Interstate Co.

Piling.
International Creosoting & Constructing Co.
Massey Concrete Products Corp.

Pipe Carriers.
Massey Concrete Products Corp.

On this Cost Proposition—



Your Success Depends on Known Values - -

THE Type DC INDUSTRIAL with its multi-purpose equipment can do a lot toward paralyzing material-handling costs in and around your yards. As a special light maintenance of way machine this crawler will prove invaluable. It is not restricted to rails, or smooth roadbeds, but will go anywhere.

Here are a few actual figures from owners:

Material	Tons handled per hour	Handling cost per ton
Busheling Scrap	54	4.6c
Coal	135	1.8c
Sand or Gravel	202	1.2c

These figures should be discussed with one of our sales engineers—Drop us a line.

You should know more about this cost reducing equipment—Send for Book 120-A.

Parker Scale-Proof Boiler

INDUSTRIAL steam-operated cranes, shovels and draglines may be equipped with the patented PARKER SCALE-PROOF BOILER. This SCALE-PROOF boiler is an exclusive INDUSTRIAL feature. It insures prolonged life, less care and the end of your boiler troubles.

Let us tell you more about this splendid excelling unit.

INDUSTRIAL WORKS
BAY CITY - - - MICHIGAN

INDUSTRIAL

BUYERS' GUIDE

Pipe, Cast Iron.
Cast Iron Pipe Publicity Bureau.
U. S. Cast Iron Pipe & Foundry Co.

Pipe, Concrete.
Massey Concrete Products Corp.

Pipe, Corrugated.
Armco Culvert & Flume Mfrs. Assn.
United Alloy Steel Corp.

Pipe, Sewer.
Massey Concrete Products Corp.

Pipe Joint Compound.
Dixon Crucible Co., Jos.

Plows, Railroad.
Western Wheeled Scraper Co.

Poles.
International Creosoting & Construction Co.
Massey Concrete Products Corp.

Posts, Bumping.
See Bumping Posts.

Posts, Fence.
See Fence Posts.

Post Hole Digger
Buda Co.

Powders
DuPont de Nemours & Co.

Power Plants, Portable
Electric Tamper & Equipment Co.

Preservation, Timber.
International Creosoting & Construction Co.

Products, Gas.
Oxweld Railroad Service Co.

Pumping Stations
Fairbanks, Morse & Co.

Pumps, Air Pressure and Vacuum, Centrifugal, Deep Well, Piston, Plunger, Rotary, Slump.
American Well Works.
Fairbanks, Morse & Co.
Gardner Governor Co.
Layne & Bowler Mfg. Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Push & Hand Car Bearings.
Hyatt Roller Bearing Co.

Push Cars.
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Mudge & Co.
Woolery Machine Co.

Rail Anchors.
Bethlehem Steel Co.
Lundie Engineering Corp.
Verona Tool Works

Rail Anti-Creepers.
See Anti-Creepers, Rail.

Rail Benders.
American Chain Co., Inc.
Buda Co.
Q. & C. Co.
Verona Tool Works.

Rail Bonds.
Verona Tool Works.

Rail Braces.
Bethlehem Steel Co.
Q. & C. Co.
Ramapo-Ajax Corp.
Wharton, Jr., & Co., Inc., Wm.

Rail Cranes
Parsons Co.

Rail Joints.
See Joint, Rail.

Rail Saws.
Q. & C. Co.

Rail Saws, Portable.
Industrial Works.
Kalamazoo Railway Supply Co.
Q. & C. Co.

Rail Springs.
Verona Tool Works.

Rammers, Sand
Ingersoll Rand Co.

Removers, Paint.
Mudge & Co.

Replacers, Car
American Chain Co., Inc.
Buda Co.
Q. & C. Co.

Retaining Walls
Federal Cement Tile Co.
R. C. Products Co., Inc.
Massey Concrete Products Corp.

Rivets.
Bethlehem Steel Co.
Interstate Iron & Steel Co.

Rods, Wire.
Interstate Iron & Steel Co.

Roller Bearings.
Hyatt Roller Bearing Co.

Roof Slabs.
Massey Concrete Products Corp.

Roofing Composition.
Barber Asphalt Co.
Lehon Co.

Rules.
Lufkin Rule Co.

Saw Mills
American Saw Mill Machinery Co.

Saw, Rigs
American Saw Mill Machinery Co.
Fairbanks, Morse & Co.

Saws, High Speed Friction
American Saw Mill Machinery Co.

Scales, Track
Fairbanks, Morse & Co.

Scales, Tape
Lufkin Rule Co.

Scrapers, Wheel, Drag and Buck.
Western Wheeled Scraper Co.

Screw Spike Drivers.
Ingersoll-Rand Co.

Section Cars.
See Cars, Section.

Sharpeners, Rock Drill Steel
Ingersoll Rand Co.

Sheet Iron.
Armco Culvert & Flume Mfrs. Assn.
United Alloy Steel Corp.

Shingles, Composition.
Barber Asphalt Co.
Lehon Co.

Shovels
Verona Tool Works

Signal Foundations, Concrete.
Massey Concrete Products Corp.

Skid Shoes.
Q. & C. Co.

Slabs, Concrete.
Massey Concrete Products Corp.

Snow Flangers.
Q. & C. Co.

Smoke Stacks.
Massey Concrete Products Corp.

Snow Melting Devices.
Q. & C. Co.

Snow Plows
Jordan Co., O. F.
Q. & C. Co.

Spikes.
Bethlehem Steel Co.
Interstate Iron & Steel Co.

Spreader Cars.
See Cars, Spreader.

Spreaders, Ballast.
See Ballast Spreaders.

Standpipes (Penstock).
Fairbanks, Morse & Co.

Stands, Switch & Target.
Bethlehem Steel Co.
Buda Co.
Q. & C. Co.
Ramapo-Ajax Corp.

Station Houses.
Massey Concrete Products Corp.

Steel, Alloy.
Interstate Iron & Steel Co.

Step Joints.
See Joints, Step.

Switches.
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wharton, Jr., & Co., Inc., Wm.

Switchmen's Houses.
Massey Concrete Products Corp.

Switchpoint Protector
Fleming Co.,

Switchstands & Fixtures.
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.

Structural Steel.
Bethlehem Steel Co.

Tampers, Tie.
See Tie Tampers.

Tank Fixtures.
Fairbanks, Morse & Co.

Tanks, Water Storage.
Fairbanks, Morse & Co.

Tapes.
Lufkin Rule Co.

Tee Rails.
See Rails, Tee.

Telegraph Poles.
See Poles.

Thawing Outfits.
Q. & C. Co.

Ties.
International Creosoting & Construction Co.

Tie Plates.
Bethlehem Steel Co.
Interstate Iron & Steel Co.
Lundie Engineering Corp.

Tie Plate Clamps.
Q. & C. Co.

Tie Rods.
Bethlehem Steel Co.

Tie Spacers
American Chain Co., Inc. Co.

Tie Tampers.
Electric Tamper & Equipment Co.
Ingersoll-Rand Co
Interstate Iron & Steel Co.

Tile, Roofing.
Federal Cement Tile Co.

Timber, Creosoted.
International Creosoting & Construction Co.

Tools, Pneumatic.
Ingersoll-Rand Co.

Tools, Track.
Buda Co.
Hackmann Railway Supply Co.
Q. & C. Co.
Verona Tool Works
Wooding Forge & Tool Co.

Tools, Wrecking.
Industrial Works.

Tongue Switches.
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.

Torches, Oxy-Acetylene Cutting & Welding.
Oxweld Railroad Service Co.

Track Drills.
See Drills, Track.

Track Gages
Bethlehem Steel Co.
Buda Co.
Kalamazoo Railway Supply Co.

Track Insulation.
Q. & C. Co.

Track Jacks.
See Jacks, Track.

Track Liners.
See Liners, Track.

Track, Portable.
Western Wheeled Scraper Co.

Track Scales
Fairbanks, Morse & Co.

Track Tools.
See Tools, Track.

Transfer Tables.
Industrial Works.

Treating Plants, Water.
American Water Softener Co.

Trestle Slabs.
Massey Concrete Products Corp.

Turntables
McMyler-Interstate Co.

Ventilators.
Q. & C. Co.

Water Columns.
Fairbanks, Morse & Co.

Water Cranes.
Fairbanks, Morse & Co.

Water Softening Plants.
American Water Softener Co.

Water Supply Contractors.
Layne & Bowler Mfg. Co.

Water Treating Plants.
American Water Softener Co.

Waterproofing Fabrics
Barber Asphalt Co.
Lehon Co.

Weed Burner.
Woolery Machine Co.

Weedkiller, Chemical
Chipman Chemical Engineering Co., Inc.

Welding, Oxy-Acetylene.
Oxweld Railroad Service Co.

Welding & Cutting Equipment.
Oxweld Railroad Service Co.

Well Systems.
Layne & Bowler Mfg. Co.

Wheels, Hand & Motor Car.
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Parsons Co.
Woolery Machine Co.

Windshields.
Mudge & Co.
Fairbanks, Morse & Co.

Wire
Interstate Iron & Steel Co.

Wire Fencing.
Cyclone Fence Co.

Wood Grapples.
Industrial Works.

Wood Preservation.
See Preservation, Timber.

Wood Working Machinery
American Saw Mill Machinery Co.

Wrecking Cranes.
Industrial Works.

ALPHABETICAL INDEX TO ADVERTISEMENTS

A

Armco Culvert & Flume Mfrs. Assn... 24
American Chain Co., Inc..... 43
American Saw Mill Machinery Co..... 49
American Water Softener Co..... 51
American Well Works..... 34

B

Barber Asphalt Co..... 50
Bethlehem Steel Co..... 6
Buda Co. 22

C

Cast Iron Pipe Publicity Bureau..... 13
Chicago Steel Foundry Co..... 44
Chipman Chemical Engineering Co., Inc. 37
Clark Car Co..... 17
Cyclone Fence Co..... 43

D

Differential Steel Car Co..... 41
Dixon Crucible Co., Jos..... 49
Du Pont de Nemours & Co., Inc., E. I. 38

E

Electric Tamper & Equipment Co..... 8
Euclid Electric & Mfg. Co..... 49

F

Fairbanks, Morse & Co.....19-20
Fairmont Railway Motors, Inc..... 4
Federal Cement Tile Co..... 14
Fleming Co..... 1

G

Gardner Governor Co..... 21

H

Hackmann Railway Supply Co..... 18
Hyatt Roller Bearing Co..... 25

I

Industrial Works..... 53
Ingersoll-Rand Co. 23
International Creosoting & Construction Co..... 27
Interstate Iron & Steel Co..... 9

J

Jordan Co., O. F..... 45

K

Kalamazoo Railway Supply Co.....29
Kentucky Rock Asphalt Co..... 44
Koppel Industrial Car & Equip. Co..... 46

L

Layne & Bowler Mfg. Co..... 48
Lehon Co. 51
Linde Air Products Co..... 35
Lufkin Rule Co..... 48
Lundie Engineering Corp. 33

M

Massey Concrete Products Corp..... 46
Matthews Corp., W. N..... 15
McMyler Interstate Co..... 16
Mechanical Manufacturing Co..... 47
Mudge & Co..... 3
Murdock Mfg. & Supply Co..... 50

N

National Lock Washer Co..... 55
North American Cement Corp..... 31
Northwestern Motor Co..... 12

O

Owen Bucket Co..... 40
Oxweld Acetylene Co..... 35
Oxweld Railroad Service Co..... 35

P

Parsons Co..... 32
Prest-O-Lite Co. 35

Q

Q. & C. Co.....10-11

R

R. C. Products Co., Inc..... 39
Rail Joint Co. 30
Railroad Accessories Corp..... 36
Ramapo Ajax Corp. 28
Reliance Manufacturing Co. 2

S

Simmons-Boardman Publ. Co.....42-50
Sullivan Machinery Co..... 51

U

U. S. Cast Iron Pipe & Foundry Co... 49
Union Carbide Sales Co..... 35
United Alloy Steel Corp..... 7

V

Verona Tool Works 56

W

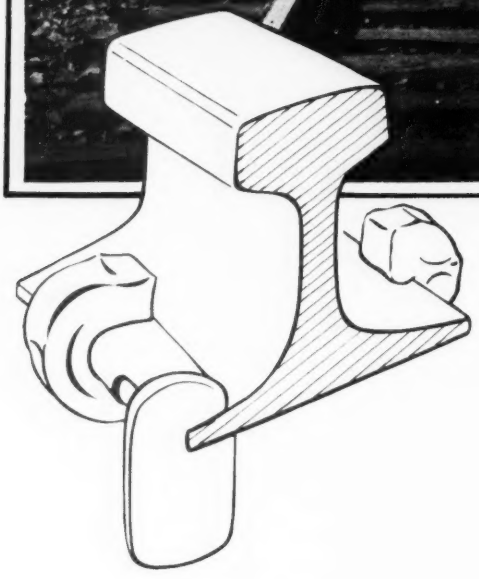
Western Wheeled Scraper Co..... 26
Wharton Jr. & Co., Inc., Wm..... 51
Woodings Forge & Tool Co..... 47
Woolery Machine Co..... 45

Pressure Counts

PURCHASE Spring Washers on a pressure basis for it is pressure that does the work to keep track bolts tight. IMPROVED HIPOWER —costs 90% less than do Nut Locks.

The National Lock Washer Co.
Newark, N. J., U. S. A.

IMPROVED HIPOWER



Why more than one anchor to a rail —

In ordinary service, one Ericson Rail Anchor should hold one rail. On grades and curves, at stations, and at other points where the braking is heavy you need more.

Not because the Ericson Anchor ever slips or creeps or chatters loose. It doesn't. Not because traffic conditions are ever too severe for the relentless grip of one anchor. They are not.

On the worst creeping rails a single Ericson Anchor will carry the tie right through the ballast without slipping on the rail. Additional anchors are needed only to distribute the load over several ties.

VERONA TOOL WORKS Pittsburgh, New York, Chicago, Boston, St. Louis, San Francisco, New Orleans, Washington, St. Paul, Denver, Baltimore, Louisville